2024 DECEMBER VOL 7 ISSUE 4

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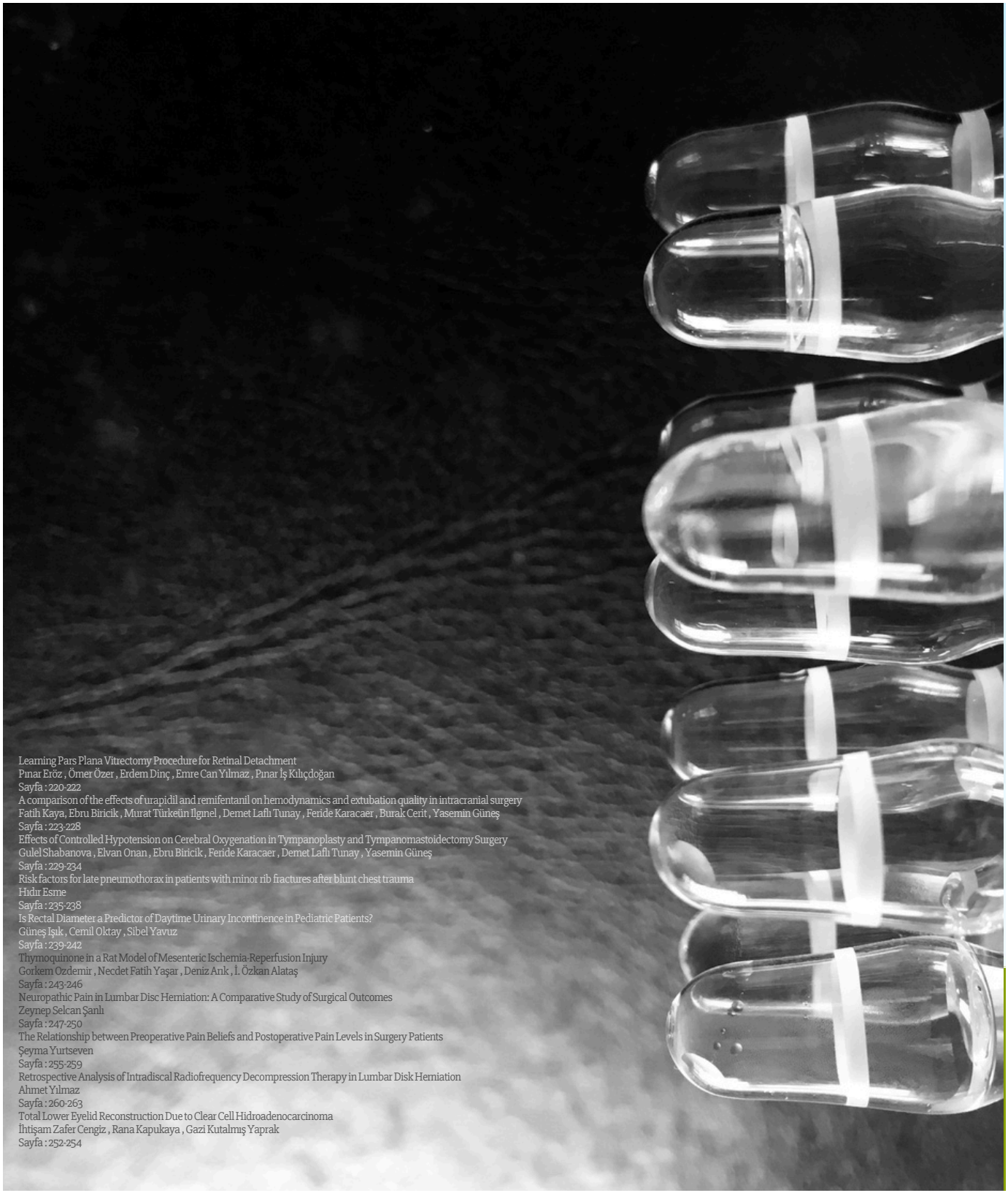

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ABSTRACTED & INDEXED

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BASE
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Türkiye Atıf Dizini

AIM

The aim of the journal is to announce offering of national and international scientific environment and share high quality research studies, case studies and reviews conducted in the field of anesthesia, pain medicine, intensive care and surgical sciences both in Turkey and abroad; and to contribute to the development of scientific communication by establishing a continuous educational platform.

SCOPE

Çukurova Anestezi ve Cerrahi Bilimler Dergisi (J Cukurova Anesth Surg) is published online three times a year (April, August, December). Special or supplement series may also be published where necessary. Manuscripts submitted to the journal are evaluated by independent peer reviews according to double blind peer review system. Scientifically reviewed manuscripts can be freely accessed through the internet without financial, legal and technical barriers. These manuscripts can be read, downloaded, copied, distributed, printed, scanned, linked to full texts, indexed, transferred as data to the software and used for any legal purpose. Authors and copyright owners agree that all users have freeaccess.
All scientific papers sent to the Çukurova Anestezi ve Cerrahi Bilimler Dergisi should take into account the recommendations of the International Committee of Medical Journal Editors and the International Standards for Editors (ICJME) and Authors of the Committee on Publication Ethics(COPE).

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ETHICAL PRINCIPLES & PUBLICATION POLICY I

Scientific Responsibility

In terms of scientific publishing standards, the articles to be submitted should be prepared in accordance with the criteria of the International Medical Journal Editors Board (ICMJE), Publication Ethics Committee (COPE).
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• Articles should not have been published anywhere before and / or should not be in the evaluation process for publication.
• In order for the evaluation process to begin, the articles must be submitted with the Copyright Transfer Form signed by all authors. For author ranking, the signature order in the Copyright Transfer Form is taken into consideration.
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• Ethics committee approval information should be stated in the MATERIAL and METHODS section, together with the name, approval date and number of the committee.
• If there is a direct-indirect commercial connection or financial support institution in the study, the authors; used commercial product, drug, company, etc. They should indicate to the editor on the presentation page that they have no commercial relationship with or what kind of relationship (consultant, other agreements) they have.
• Authors are responsible for reporting all personal and financial relationships related to the study. It must be clearly declared whether there is any conflict of interest associated with the application and / or evaluation of the article.
• The authors are responsible for the compliance of the articles with scientific and ethical rules.

1. Authors

Authors must comply with all authorship policies and conflict of interest statements detailed in Sections IIA and B of this document.

a. Predatory or Fake Journals

These are called predatory journals because of the rapidly increasing numbers of journals called 'scientific journals' but that publish all the posts for a fee without any screening for profit. It has become more important to maintain some standards in scientific journalism. For this reason, our journal follows the recommendations of organizations such as ICMJE, COPE and WAME and complies with the standards.

2. Journals

a. security

Manuscripts submitted to journals are privileged communications that are the private, confidential property of the author, and authors can be harmed by premature disclosure of any or all the details of a manuscript.
For this reason, editors should not share with anyone other than the authors and reviewers whether it has been handled and reviewed, its content and status in the review process, including the reviewers' critique and eventual fate. Requests from third parties to use reviews in manuscripts and legal proceedings should be politely refused, and editors should do their best not to provide such confidential material as subpoenas.
Editors should also make it clear that the reviewers must keep the manuscripts, related materials, and information they contain strictly confidential.
Reviewers and editorial staff should not publicly discuss the author's work, and reviewers should not endorse the ideas of the authors prior to publication. Reviewers should not keep the article for their personal use and should destroy the hard copies of the articles and delete the soft copies after submitting their reviews.
When an article is rejected, it is best practice for journals to delete copies from their editorial systems unless local regulations require retention.
Journals that maintain copies of rejected manuscripts should disclose this practice in the Authors' Notice.
When an article is published, journals should retain copies of the original submission, review, revision, and correspondence for at least three years, and possibly permanently, depending on local regulations, to answer future questions about the work.
Editors should not publish reviewers' comments without the permission of reviewers and authors. If journal policy will protect authors against the reviewer's identity and comments are not signed, that identity should not be disclosed to the author or others without the express written consent of the reviewers.
Confidentiality may need to be breached if fraud or alleged fraud is present, but editors notify authors or reviewers of their willingness to do so, and confidentiality should be honored otherwise.

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Editors should do their best to ensure that manuscripts are processed in a timely manner with the resources available to them. If editors are going to publish an article, they should try to do it on time and planned delays should be negotiated with the authors. If a journal has no intention of continuing an article, editors should try to reject the article as soon as possible to allow the author to submit it to a different journal.

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ETHICAL PRINCIPLES & PUBLICATION POLICY II

c. Peer Review

Peer review is a critical evaluation of manuscripts submitted to journals by experts who are not usually part of the editorial staff. Peer review is an important extension of the scientific process, as impartial, independent, critical evaluation forms the core of all scientific work, including scientific research.

The true value of peer review is debated, but the process facilitates a fair hearing for an article among members of the scientific community. More practically, it helps editors decide which articles are appropriate for their journal. Peer review often helps authors and editors improve the quality of their reporting.

It is the editor's responsibility to ensure that reviewers have access to all material related to the review of the manuscript, including additional material for email-only, for selection of appropriate reviewers, and to ensure that reviewer reviews are appropriately evaluated and interpreted in context.

A peer-reviewed journal is not obligated to submit articles submitted for review and is not obligated to follow up on reviewers' suggestions, positive or negative. The editor of a journal is ultimately responsible for the selection of all content, and editorial decisions may be made aware of matters unrelated to the quality of a manuscript, such as journal relevance. An editor may reject any article at any time, including after it has been accepted when concerns about the integrity of the work arise.

Journals may differ in the number and types of articles they submit for review, the number and types of reviewers they seek for each article, whether the review process is open or blind, and other aspects of the review process. For this reason, and as a service to authors, journals should publish a description of the peer review process.

Journals should ultimately review their decision to accept or reject a paper and acknowledge the reviewers' contribution to their journals. Editors are encouraged to share reviewers' comments with reviewers of the same article so that reviewers can learn from each other during the review process.

As part of peer-review, editors are encouraged to review research protocols, statistical analysis plans if separate from the protocol, and/or contracts related to project-specific studies. Editors should encourage authors to make such documents public at the time of or after publication before accepting such work for publication. Some journals may require these documents to be publicly posted as a condition of their acceptance.

Log requirements for independent data analysis and availability of publicly available data were published during this revision; this reflects evolving views on the importance of data availability for pre- and post-publication peer review. Some journal editors currently request statistical analysis of trial data by an independent biostatistician before accepting studies for publication. Others encourage or request authors to share their data with others for review or reanalysis, while others indicate whether study data may be used by third parties for viewing and/or reanalysis. Each journal should establish and publish its own specific requirements for data analysis and registration in a place easily accessible to potential authors.

Some people believe that true scientific peer review only begins when a paper is published. In this regard, medical journals should have a mechanism for readers to submit comments, questions or criticisms on published articles, and authors should respond appropriately and cooperate with requests for journal data or request additional information regarding the paper. occurs after publication (see Chapter III).

d. Integrity

Editorial decisions should be based on the relevance of a manuscript to the journal and its contribution to the evidence for its originality, quality, and important questions. These decisions should not be influenced by business interests, personal relationships, or agendas, or by findings that are negative or credibly question accepted wisdom. In addition, authors should submit for publication or make it publicly available, and editors should not consider publication, exclude studies with findings that are not statistically significant or have inconclusive findings. Such studies may provide evidence that evidence pooled with other studies through meta-analysis can still help answer important questions, and public recording of such negative or inconclusive findings may prevent unintended duplication of effort or other researchers considering similar studies. can be valuable to Journals should clearly outline the appeals process and have a system in place to respond to appeals and complaints.

e. Journal Metrics

Journal impact factor is widely misused as a proxy for research and journal quality and as a measure of the benefits of research projects or individual researchers, including their eligibility for recruitment, promotion, hiring, awards, or research funding. The ICMJE recommends that journals reduce the emphasis on impact factor as a single measure, instead offering a set of articles and journal metrics related to their readers and authors.

3. Reviewers

Manuscripts submitted to journals are privileged communications that are the private, confidential property of the author, and authors may suffer from early disclosure.

Therefore, the reviewers should keep the articles and the information they contain strictly confidential. Reviewers should not publicly discuss the author's work and properly write down the authors' ideas before the article is published. Reviewers should not keep the article for their personal use and should destroy the copies of the articles after reviewing them.

Reviewers are expected to respond promptly to review requests and submit reviews within the agreed timeframe. Reviewers' comments should be constructive, honest, and polite.

Reviewers must declare conflicts of interest and withdraw themselves from peer review if there is a conflict.

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The journal "Çukurova Anestezi ve Cerrahi Bilimler Dergisi" are committed to publishing only original material, i.e., material that has neither been published elsewhere, nor is under review elsewhere.
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1. On policy

1.1. Every institution of higher education should have a policy assuring that peer-reviewed versions of all future scholarly articles by faculty members are deposited in the institution's designated repository. (See recommendation 3.1 on institutional repositories.)

- Deposits should be made as early as possible, ideally at the time of acceptance, and no later than the date of formal publication.
- University policies should respect faculty freedom to submit new work to the journals of their choice.
- University policies should encourage but not require publication in OA journals, and should help faculty understand the difference between depositing in an OA repository and publishing in an OA journal.
- When possible, university policies should be adopted by faculty vote, should require immediate OA, and should welcome repository deposits even when not required (e.g. datasets, conference presentations, books or book chapters, work published before the policy's adoption, and so on).
- When publishers will not allow OA on the university's preferred terms, we recommend either of two courses. The policy may require dark or non-OA deposit in the institutional repository until permission for OA can be obtained. Or the policy may grant the institution a nonexclusive right to make future faculty research articles OA through the institutional repository (with or without the option for faculty to waive this grant of rights for any given publication).

1.2. Every institution of higher education offering advanced degrees should have a policy assuring that future theses and dissertations are deposited upon acceptance in the institution's OA repository. At the request of students who want to publish their work, or seek a patent on a patentable discovery, policies should grant reasonable delays rather than permanent exemptions.

1.3. Every research funding agency, public or private, should have a policy assuring that peer-reviewed versions of all future scholarly articles reporting funded research are deposited in a suitable repository and made OA as soon as practicable.

- Deposits should be made as early as possible, ideally at the time of acceptance, and no later than the date of formal publication.
- When publishers will not allow OA on the funder's terms, funder policies should require grantees to seek another publisher.
- If funder policies allow embargoes before new work becomes OA, the embargoes should not exceed six months. Policies should allow no embargoes at all for uncopyrightable work.
- Funders should treat publication costs as research costs, and should help grantees pay reasonable publication fees at fee-based OA journals.
- When possible, funder policies should require libre OA, preferably under a CC-BY license or equivalent.
- A repository is suitable for this purpose when it provides OA, supports interoperability with other repositories, and take steps toward long-term preservation. The funder's choice should be determined by ongoing research into questions such as which choice best fosters the deposit of covered articles, the utility of deposits, the convenience of funders and authors, and incentives for the further growth of OA.

1.4. All university and funder OA policies should require deposit in a suitable OA repository between the date of acceptance and the date of publication. The metadata should be deposited as soon as it is available and should be OA from the moment of deposit. The full-text should be made OA as soon as the repository has permission to make it OA.

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Article text should start from the second page.
The abstract should have a maximum length of 250 words. The Objective should include Materials and Methods, Results and Conclusion. Keywords with at least 3 (three) words should be written with a space between the abstract.
Research article format; Introduction, material and method, findings, discussion and conclusion
Case presentation format; Introduction, case report, history, tests, progress, treatment and outcome, discussion-literature review, recommendations
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If the name is not given in the sentence, the source number should be given in superscript before the pointYear, volume, start and end pages should be gn in journal sources, but only the year should be stated in book sources.
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References should contain the full surnames of the authors and the first letters of their names.
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Manuscripts and punctuation marks must comply with the following examples.
The source is a magazine; The author should be written in full capitalization, and the first name should be written as first letter and larger. Title of article. The journal is abbreviated to Index Medicus. Year: Volume: First page number-Last page number
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Tables:
1. Tables should be written on a separate page with a single line spacing.
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5. Transverse and longitudinal lines should not be used in the table, only a straight line should be drawn at the top and bottom.
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9. The pictures / photos should be colored, the details should be clearly visible and clear.
10. Figures, pictures / photos are separate. jpg file should be added to the system.
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STATISTICS

TIME STATISTICS, ACCEPTANCE-REJECTION STATISTICS 2022

	Number of Articles Calculated	Average Time (Day)
Article Submission - Withdraw:	3	13
Article Submission - Return:	8	58
Article Submission - First Editor Assignment:	75	4
First Editor Assignment - Acceptation Decision Statistic		
Peer review:	54	58
Non peer review:	0	0
First Editor Assignment - Rejection Decision Statistic		
Peer Review:	5	84
Non-Peer Review:	7	12
Article Submission - Acceptation Decision Statistic		
Peer Review:	54	62
Non-Peer Review:	0	0
Article Submission - Rejection Decision Statistic		
Peer Review:	5	8
Non-Peer Review:	7	13

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Learning Pars Plana Vitrectomy Procedure for Retinal Detachment

Pınar Eröz[1], Ömer Özer[2], Erdem Dinç[3], Emre Can Yılmaz[3], Pınar İş Kılıçdoğan[4]

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Abstract

Aim: This study aimed to observe the development of surgical technique and anatomical success during the first 7 years of a new surgeon's performing retinal surgery.

Methods: Patients undergoing PPV surgery between January 2017 and January 2024 by an inexperienced surgeon in vitreoretinal surgery were studied. Surgical technique, tamponade type and anatomical success were recorded.

Results: Anatomical success was achieved in 88.1% of patients at the first surgery. There was no significant difference between groups in the number of surgeries required to achieve anatomical integrity and retinal stabilisation. (p=0.64). There was a statistically significant difference between groups in the type of tamponade used (p<0.001).

Conclusion: In this study, primary anatomical success was not related to number of vitreoretinal procedures. To achieve acceptable success rates, the learning curve for less experienced surgeons requires sufficient time. Although surgical experience is not the only factor influencing the outcome of retinal detachment surgery, it is a powerful factor in the success of the operation

***Keywords**: retinal detachment; pars plana vitrectomy; learning; inexperienced vitreoretinal surgeon*

1. Introduction

Primary pars plana vitrectomy (PPV) is a widely accepted procedure for the treatment of uncomplicated rhegmatogenous retinal detachment (RRD) as a result of advances in vitrectomy technique[1].The advantages of primary vitrectomy are that the surgeon can see small retinal tears intraoperatively and remove vitreous traction, and all intraoperative retinal applications can be performed with fluid-air exchange[2].

The learning applies to many procedures and specialities, but in medicine, and particularly in surgery, it is an issue that needs to be considered and discussed as it can have potentially serious consequences. The learning curve in surgery is often used to describe how difficult it is to master a procedure, and outcome measures are usually the complication and failure rates. This is why the success rate of surgery is also known as the surgical learning curve.

Surgical learning curves are typically defined as the change in a surgical parameter over time. Studies of learning for surgical procedures are becoming increasingly important as learning curves can have an impact on surgical measures, clinical outcomes and cost-benefit decisions[3]. Vitreoretinal surgery is considered to have one of the longest learning, despite the lack of standardisation.

After reaching a certain level of proficiency in surgical technique, a temporary loss of performance may occur. It is thought that taking on more challenging cases and increasing the surgeon's confidence may cause this situation[4].

The aim of this study was to evaluate the minimum learning time required for a new surgeon to manage during the first 7 years of retinal surgery by observing the evolution of surgical technique. We also wanted to determine the optimal number of surgeries required for successful pars plana vitrectomy for retinal detachment.

2. Materials And Methods

Ethical approval was obtained from the Mersin University Faculty of Medicine Clinical Research Ethics Committee and the study was conducted according to the principles of the Declaration of Helsinki. Patients who were treated with PPV for RRD between January 2017 and January 2024 and had at least 12 months of postoperative follow-up were included in the study. Eyes with proliferative vitreoretinopathy (PVR) grade C or higher, eyes with penetrating eye injury, or eyes with a history of other vitreoretinal surgery were excluded. Difficult cases such as those with high myopia, macular holes, and syndromic diseases were excluded from the analysis. The number of cases was divided into quartiles to group the cases. Med-

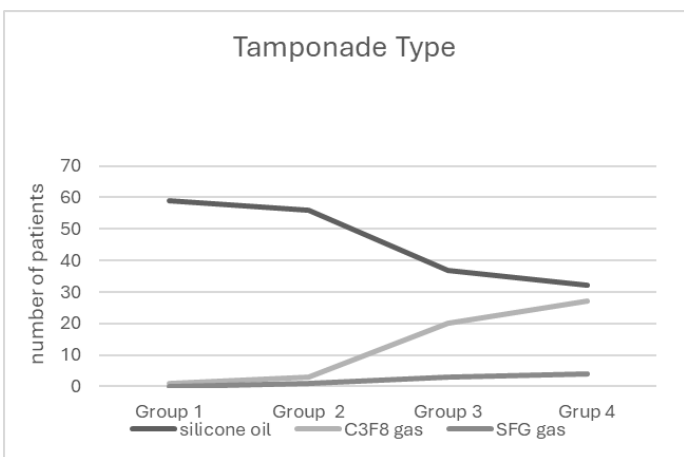
Corresponding Author: Pınar Eröz, p.eroz@hotmail.com, Received: 23.08.2024, Accepted: 26.12.2024, Available Online Date: 31.12.2024 Cite this article as: Eröz P, Özer Ö, Dinç E, Yılmaz EC, Kılıçdoğan PI. Learning Pars Plana Vitrectomy Procedure for Retinal Detachment. J Cukurova Anesth Surg. 2024; 7(4): 220-2. https://doi.org/10.36516/jocass.1543194

ical records and optical coherence tomography (OCT) images (Heidelberg HRA-OCT Spectralis®, Heidelberg Engineering GmbH, Heidelberg, Germany) of all patients included in the study were retrospectively reviewed.

All operations were performed by the same surgeon under general anaesthesia using 23G vitrectomy equipment (Constellation vitrectomy unit; Constellation®, Alcon, Fort Worth, TX, USA). A complete vitrectomy with vitreous base cleaning, tear flap excision and internal fluid drainage was performed in all cases. Scleral buckling was not performed in any patient. Laser or cryopexy was applied to the tear areas according to the surgeon's preference. Depending on the difficulty of the case, 1000 centistokes silicone oil, SF6(GOT Multi SF6;Alchimia, Beijing) or C3F8 (GOT Multi C3F8; Alchimia, Beijing) was chosen by the surgeon. Phacoemulsification and intraocular lens implantation were performed in phakic patients before vitrectomy. At the end of the operation, 23G trocars were removed and transconjunctival suture was performed using 7/0 vicryl. All patients received postoperative subconjunctival gentamicin sulphate 20 mg (Genta ampoule, I.E. Ulugay, Istanbul, Turkey) and dexamethasone 4 mg (Dekort ampoule, Deva, Istanbul, Turkey). Anatomic success was defined as a flat retina in the first 6 months after removal of silicone oil or gas tamponade after PPV.(fig 1)

Figure 1

Distribution of tamponade type preference according to groups



2.1. Statistical analyses

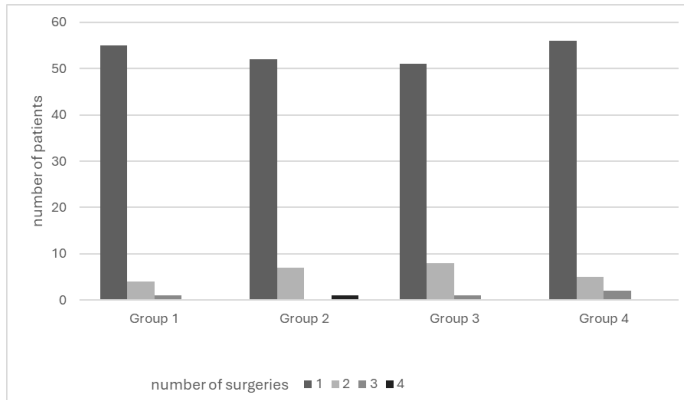
Statistical analysis of the study data was performed with the SPSS 24.0.1 package programme (IBM Corp, Armonk, NY, USA). Categorical variables were expressed as number (n) and percentage (%) and numerical variables were expressed as mean ± standard deviation. The normal distribution of continuous variables was checked by the Shapiro-Wilk test. Student's t test and one-way ANOVA test were used to compare the means of the groups. The relationship between categorical variables was investigated by Chi-Square analysis. The statistical significance level was taken as $p<0.05$ for all comparisons.

3. Results

There were 179 male (73.7%) and 64 female (26.3%) patients included in the study. The mean age of the 243 patients included in the study was 60.51±9.96 years, and there was no statistically significant difference in age between the groups (p=0.24). Combined surgery was performed in 55.6% of the patients, while 44.4% underwent vitrectomy only. In group 2, only one patient underwent 4 surgeries to ensure anatomical success, while the maximum number of surgeries was 3 in the other groups. (Fig 2) At the first surgery, 88.1% of patients achieved anatomical success. While 29 patients underwent more than one operation, the surgical success rate was 97.3% for the second operation and 99.6% for the third. Silicone tamponade was the most preferred tamponade in all groups at surgery. There was no significant difference between the groups in terms of gender distribution and surgical direction (p=0.47 p=0.64, respectively). There was no significant difference between the groups in the preference for combined surgery or vitrectomy (p=0.06). There was no significant difference in the number of surgeries required to achieve anatomical success between the groups (p=0.64). The difference between the groups in terms of the type of tamponade used was statistically significant ($p < 0.001$).

Figure 2

Number of surgeries according to groups



4. Discussion

Surgical learning are defined as the time and number of operations required for a surgeon to successfully perform a new surgical procedure[5].

Surgical experience is widely recognised to significantly influence surgical outcome, performance and management of potential complications. Using smaller diameter surgical instruments requires more precision and caution, but offers benefits including faster surgery, less tissue manipulation, decreased infection, less post-operative pain and faster visual recovery. If smaller incisions are made with smaller instruments, it may be more difficult to pass the instruments through the ports. Between 20 gauge procedures requiring sutures and 25 and 27 gauge procedures with smaller but more limited applications, 23 gauge techniques and instruments offer an ideal compromise for many surgeons[6].

In a study of retinal surgeons in Alberta, the minimum number of operations required for successful retinal detachment surgery was one and the maximum was five. The overall average success rate for all surgeons was 84.9% (3,680/4,336) and if a second operation was required, the overall success rate for this operation was 79.1% (519/656). The highest success rate was seen in patients aged 90-99 years, and the lowest in patients aged 0-9 years[7]. Success rates stabilise after 500 operations, according to a German study. There was no correlation between the total number of surgeries and the primary anatomical success rate. There was no significant dif-

ference between the learning curves for vitrectomy and scleral buckling, and there was no correlation between the primary anatomical achievement of the surgeon and the total number of vitreoretinal surgeries performed by the surgeon.[8] In contrast, studies of RRD surgery performed by inexperienced retinal surgeons have reported primary success rates of 70% to 80%, with approximately 200 operations and learning after 2 years[2,9]. Dugas et al. showed a learning curve effect where the success rate increased from 66.7% in the first 60 cases of PPV to 80% in the last 60 cases[2]. The switch to the 23G technique after approximately 100 operations is perceived by the surgeon to be more comfortable and safer[10]. In the present study, no correlation was found between the number of surgeries and primary anatomical success rate. In terms of surgical stability, we believe that an average of 60 surgeries is a sufficient number.

According to a study conducted in China, the number of years a surgeon spends in the profession is not directly related to the intensity of surgery. More experienced surgeons had a longer interval than less experienced surgeons for complicated operations[11]. Similarly, the present study did not find a direct relationship between years of practice and surgical intensity. As complicated cases were excluded from the study, there was no decrease in performance due to difficult cases and similar surgical success was observed in all groups.

In the present study, the preference for silicone tamponade was predominant at the beginning of surgery, while there was a statistically significant increase in the preference for gas tamponade from the third trimester onwards. It can be concluded that the surgeon believes he has achieved technical competence and is trying different techniques.

In a study of 3786 RD procedures performed by 10 surgeons early in their vitreoretinal careers, female surgeons had a faster learning curve and a primary success rate of 90% (3420 of 3786). There are differences in learning curves between surgeons and it has been shown that the number of operations alone is not an indicator of skill level[9]. The improvement in visual acuity does not match the rate of anatomical improvement[12]. In this study, primary anatomical success was not related to number of vitreoretinal procedures.

One of the limitations is the retrospective and single-centre nature of the study.

It is important to be fully equipped from the outset, although some complications are inevitable. Practical training on animals and the use of simulation equipment will be useful in the surgical management of intraoperative complications. Learning for inexperienced surgeons require time to achieve acceptable success rates. Although surgical experience is not the only factor influencing the outcome of retinal detachment surgery, it is a powerful factor in the success of the operation.

Statement of ethics

Ethical approval was obtained from the Mersin University Faculty of Medicine Clinical Research Ethics Committee and the study was conducted by the principles of the Declaration of Helsinki (27/12/23 2023/897). Informed consent forms were obtained from all patients and control subjects.

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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A Comparison of the Effects of Urapidil and Remifentanil on Hemodynamics and Extubation Quality in Intracranial Surgery

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Abstract

Aim: Maintaining stable hemodynamics during emergence is crucial for reducing cerebral perfusion pressure and minimizing risk of bleeding. We aimed to compare effects of urapidil and remifentanil on extubation quality and hemodynamics during extubation.

Methods: 90 patients aged 18-65 years, ASA 1-3 included. Anesthesia was maintained with remifentanil 0.125-0.25 μg/kg/min and sevoflurane 1-2% for all groups. In group I, remifentanil infusion is reduced to 0.02-0.03 μg/kg/min last 15 min of surgery. In group II, remifentanil infusion is stopped 15 min before end of surgery. After 5 min, bolus dose of urapidil (12.5mg) is given and urapidil infusion (3.2-4.8μg/kg/min) is started. In group III, remifentanil infusion is stopped 15 min before end of surgery and urapidil infusion (3.2-4.8 μg/kg/min) is started. Hemodynamics, entropy values and Glasgow Coma Scale were recorded last 15 min and up to 5 min after extubation.

Results: Statistically significant differences observed between the mean values of SAP (systolic arterial pressure), MAP (mean arterial pressure) and DAP (diastolic arterial pressure) before and after extubation ($p<0.05$). In group I, the mean values of SAP, MAP and DAP at baseline were lower than the mean values at 1-3 and 5 min after extubation. In groups II-III, SAP, MAP and DAP at baseline were higher than 1-3-5 min after extubation.

Conclusion: Both infusion and bolus+infusion of urapidil administration at end of intracranial surgery, effectively prevents haemodynamic reactions secondary to extubation and controls blood pressure without affecting heart rate. In addition, quality of extubation, extubation time were similar.

***Keywords**: Urapidil, remifentanil, hemodynamics, intracranial surgey*

1. Introduction

During neurosurgery, large amounts of catecholamines may be released because of the sympathetic activity caused by surgical stress. Hemodynamic changes such as tachycardia and hypertension may occur during intubation and extubation. These sympathetic responses can lead to bleeding and postoperative cardiac events during the perioperative period[1-3]. Hypertension is associated with increased postoperative risk and major adverse cardiac events within seven postoperative days[4].

To avoid sympathetic responses, agents such as opioids, dexmedetomidine, lidocaine, and β-blockers can be administered perioperatively[5-8].

Remifentanil is an opioid with rapid onset of action and belongs to the class of short-acting opioids.

It is hydrolyzed from blood and tissues by non-specific esterases. Remifentanil can suppress sympathetic responses and provide hemodynamic stabilization and is therefore considered an effective drug for the management of hemodynamic parameters in neurosurgery[9-18]. Urapidil is a selective α-1 antagonist used to control hypertension. Urapidil mainly antagonizes postsynaptic alpha-1 adrenergic receptors; but also stimulates 5-HT1A receptors, resulting in vasodilation and blood pressure reduction without reflex tachycardia. After intravenous administration, urapidil has a rapid onset and short duration of action, and the dose can be easily adjusted according to the hemodynamic response[19-26].

Our primary aim was to compare the results of urapidil and remifentanil in suppressing hemodynamic responses during extubation, and secondarily to assess their effects on the quality of extubation and depth of anesthesia in intracranial surgery.

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2. Materials and Methods

This study was approved by Institutional Review Board (IRB Number:166/11, Date:07/04/2022) and written informed consent was obtained from all patients before enrolment in the trial. It was aimed to include 30 patients per group who American Society of Anesthesiologist (ASA) physical status classification I-III, 18 -65 years. Exclusion criterias were aged >65 years, ASA physical status IV-V, greater than first-degree AV block, history of pulmonarry disease, drug allergy, uncontrolled hypertension, bronchospasm, coronary artery disease, renal or hepatic disease, presence of cerebral vasospasm, elevated intracranial pressure and pregnancy or lactation. In addition, patients with heart rate (HR) <50 bpm before drug administration and systolic blood pressure <80 mmHg and patients with elevated blood pressure levels (systolic blood pressure >160 mmHg) despite treatment with antihypertensive drugs were excluded from the study.

Standard ASA monitoring (electrocardiogram (ECG), noninvasive blood pressure, pulse oximeter, and temperature) was applied to patients who were admitted to the operating room without premedication. An entropy probe was placed in all patients to preoperatively monitor the depth of anesthesia. Baseline hemodynamic variables (systolic arterial blood pressure (SAP), mean arterial blood pressure (MAP), diastolic arterial blood pressure (DAP), and HR) were recorded. Before anesthesia induction, intravenous access was obtained, and fluid therapy was started with 5-10 ml/kg NaCl or Lactated Ringer's solution. Propofol 2 mg/kg, rocuronium 0.6 mg/kg and remifentanil 0.5 µg/kg were used for anesthesia induction and endotracheal intubation was performed after adequate muscle relaxation was achieved.

Central venous catheterization was performed via the subclavian or jugular vein, and invasive right radial artery catheterization was performed to continuously monitor arterial blood pressure and blood gas, hemoglobin and blood sugar values. In all patients, the lungs were ventilated with 40% 0_2 and 60% N_2O, maintaining the end-tidal carbon dioxide concentration in the range of 30-35 mmHg. Anesthesia was maintained with remifentanil 0.125-0.25 µg/kg/min and sevoflurane 1-2%. The depth of anesthesia adjusted with entropy between 40-60 values. The target MAP was 75-95 mmHg during the intraoperative period.

Mannitol 2.5 ml/kg alone or mannitol/hypertonic saline combination (1.25 ml/kg mannitol, 1.25 ml/kg hypertonic saline) and dexamethasone (16 mg) were administered for brain relaxation. If the brain was edematous during the dural incision, hyperventilation ($PaCO_2$ at 30 mmHg), intravenous bolus propofol (30-40 mg), and cerebrospinal fluid (CSF) drainage were performed.

During the last 15 min of surgery (during subcutaneous suturing), the sevoflurane concentration was reduced to 0.4-0.6% and patients were randomly assigned to three groups using a random number table.

Group 1; (remifentanil group); remifentanil infusion was reduced to 0.02-0.03 µg-kg-min and continued until extubation.

Group II; (Urapidil bolus + infusion group); remifentanil infusion was stopped and after 5 min bolus of urapidil (12.5 mg) was given, then urapidil infusion (3.2-4.8 µg/kg/min) was administered until extubation, and urapidil infusion was stopped at extubation.

Group III; (Urapidil infusion group); remifentanil infusion was stopped and then urapidil infusion (3.2.-4.8 µg/kg/min) was administered (without bolus urapidil) until extubation, urapidil infusion was stopped at extubation.

Tramadol 2 mg/kg (at last 45 min) and paracetamol 10 mg/kg (at last 20 min) were administered to all patients for postoperative analgesia.

At the end of the operation, sevoflurane was discontinued; and all participants were ventilated with 100% oxygen at 6 L/min. Atropine (15 µg/kg and neostigmine (40 µg/kg) were used for decurarisation. The patient met the extubation criteria which were defined as sustained tetanus for more than 5 s, a respiratory rate of less than 12 breaths per minute, positive head lift, hand grip, and eyes following commands.

Extubation time was defined as the time from the cessation of the inhaled agent to the removal of the endotracheal tube. Hemodynamic parameters, entropy values, and possible side effects were recorded during extubation and during the first 5 minutes (1st, 3rd and 5th minutes) after extubation.

The patients' response status during extubation was assessed using an adapted 5-point scale. On this scale, 1 point indicated no cough and muscle rigidity, 2 points indicated mild cough for easy extubation, 3 points indicated moderate cough, 4 points indicated severe cough or muscle rigidity, and 5 points indicated too agitated to be extubated. After extubation, when the patients were fully conscious and hemodynamically stable, they were transferred to the neurosurgical intensive care unit.

2.1. Statistical analyses

A prior power analysis determined that a minimum of 20 patients in each group was required to detect a difference in MAP of 15 mmHg at a significance level of 0.05 (type I error) and 80% power.

The IBM SPSS 25 program was used for the statistical analyses applied in the study. Continuous variables are presented as mean±standard deviation and median (1st quartile-3rd quartile), while categorical variables are presented as frequencies and percentages. The one-way ANOVA test was used for group comparisons on normally distributed data, the Kruskal-Wallis test for group comparisons of non-normally distributed data, and the dependent samples t-test and Wilcoxon signed-rank test were used to examine the difference between two related measures. Where there were differences between the groups, multiple comparison tests were used to determine which groups differed from each other. The relationship between categorical variables was examined using the chi-square test and was considered statistically significant if the p-value was <0.05.

Table 1

Demographic Values and Operation Characteristic in Groups.

Variables	mean±SS	Min-Max
Age (year)	47.70±13.80	18-65
Weight (kg)	76.34±1.92	45-130
Operation time (h)	3.57±1.07	1.5-7.5
Extubation time (min)	10.71±2.34	5-17
Gender	n	(%)
·Female	47	%52.2
·Male	43	%47.8
ASA		
·ASA I	44	%48.9
·ASA II	46	%51.1
Comorbidite		
·Yes	46	%51.1
·No	44	%48.9
Operation Type		
·Supratentorial	59	%65.6
·Infratentorial	31	%34.4

3. Results

Demographic variables and operative data were not significantly different between groups (p>0.05), (Table 1).

3.1. Hemodynamic Variables Before Extubation

This data presented in Table 2. The mean SAP in Group 1 at 1, 2, 3, and 5 min before extubation was higher than that in Groups 2 and 3 (p<0.05). The mean SAP at 7th min was significantly higher in group 1 than in Group 2 (p<0.05). At 12 min, the mean SAP of Group 2 was higher than that of Groups 1 and 3 (p<0.05). In addition, the mean DAP of Group 1 was higher than that of Groups 2 and 3 at the 1st, 2nd, 3rd and 5th min before extubation. At 12 min, the mean DAP of Group 2 was higher than the mean DAP of Groups 1 and 3. The MAP of group 1 at the 1st, 2nd, 3rd, 5th and 7th min before extubation was higher than that of groups 2 and 3 before extubation. There were no statistically significant differences between the groups in heart rate, peripheral oxygen saturation and entropy RE values at any time before extubation.

3.2. Hemodynamic Variables after Extubation

This data presented in Table 3. After extubation, the mean SAP, DAP, and MAP were higher in Group 1 than in Groups 2 and 3 at various time points (at the 0th, 1st, 3rd and 5th minutes after extubation). However, there was no difference in heart rate, entropy RE values, or peripheral oxygen saturation between the groups at any time after extubation.

3.3. Extubation Quality Score and Side Effects

Extubation quality was similar between the groups, and no severe coughing or straining was observed in any of the groups. The Glasgow Coma Score was 14-15 in all patients postoperatively, indicating good neurological status. Furthermore, no complications or side effects were observed in the early postoperative period.

Table 2

Systolic, Diastolic and Mean Arterial Pressure and HR Values in Groups

Before the ext.	Group I	Group II	Group III	p
1.min				
·SAP	131.93±14.70	108.33±12.65	111.30±11.33	0.000
·DAP	75.70±12.38	62±9.58	61.43±8.81	0.000
·MAP	97.07±12.96	78.90±9.42	79.63±7.33	0.000
·HR	69.03±15.28	66.7±15.09	64.63±13.52	0.503
2. min				
·SAP	126.97±14.42	107.03±12.70	110.43±11.26	0.000
·DAP	72.90±12.19	60.97±8.93	60.63±8.31	0.000
·MAP	93.53±12.51	78.13±8.85	78.67±7.54	0.000
·HR	64.60±11.77	65.17±14.80	63.73±14.56	0.721
3. min				
·SAP	124.93±15.44	107.17±13.34	110.40±12.24	0.000
·DAP	72.07±13.16	61.63±9.56	61.5±9.53	0.000
·MAP	92.53±13.83	78.37±10.04	79.10±8.92	0.000
·HR	64.60±11.77	65.17±14.80	63.73±14.56	0.939
5. min				
·SAP	119.47±16.71	107.47±12.17	108.67±10.63	0.001
·DAP	68.93±11.85	62.47±9.35	60.10±8.88	0.003
·MAP	88.47±13.30	79.47±9.52	77.80±7.94	0.001
·HR	63.40±11.68	63.70±15.42	63±14.26	0.823
7. min				
·SAP	115.93±15.49	105.60±11.33	109.43±12.55	0.012
·DAP	67.63±10.99	61.97±9.55	60.60±8.54	0.015
·MAP	86.43±12.32	79.20±9.54	78.17±8.86	0.005
·HR	64.23±13.02	64.0±14.15	63.3±14.62	0.899
10. min				
·SAP	111.20±13.56	110.5±11.03	109.37±13.64	0.855
·DAP	65.5±11.09	64.40±9.21	60.77±9.41	0.161
·MAP	82.80±11.38	81.77±9.83	78.17±9.57	0.193
·HR	62.5±10.68	67.07±15.04	62.53±14.48	0.362
12. min				
·SAP	107.60±12.74	121.17±14.15	11037±15.25	0.001
·DAP	63.17±10.91	70.73±13	61.30±10.33	0.005
·MAP	79.70±10.93	89.47±13.06	79.53±11.45	0.002
·HR	62.17±11.13	68.23±16.20	62.63±14.74	0.284
15. min				
·SAP	103.43±12.03	107.07±13.93	110.03±14.08	0.166
·DAP	60±9.42	63.70±10.98	62.30±11.92	0.413
·MAP	76.43±9.81	79.77±12.18	79.73±12.17	0.435
·HR	61.10±10.74	65.67±15.56	64.47±16.44	0.451

Table 3

Hemodynamic Variables during and after the Extubation

(mmHg)	Group I	Group II	Group III	P valeu
During extubation				
·SAP	144.20±14.14	116.47±11.60	121.93±11.74	0.001
·DAP	82.37±12.34	66.67±10.12	65.33±9.35	0.001
·MAP	105.90±13.52	85.20±9.26	86.47±8.92	0.001
1. min after ext.				
·SAP	145.50±15.60	120.47±12.28	123.63±12.34	0.001
·DAP	83.87±11.78	67.90±8.86	64.87±8.82	0.001
·MAP	107.07±13.39	87.77±9.20	86.43±9.36	0.001
3. min after ext.				
·SAP	144.17±14.98	122.5±12.57	124.8±11.24	0.001
·DAP	80.97±11.48	68.33±10.16	66.63±9.35	0.001
·MAP	104.60±12.71	88.27±10.15	88.23±9.44	0.001
5. min after ext.				
·SAP	145.63±15.28	123.03±11.03	125.10±11.47	0.001
·DAP	80.83±13.37	69.13±9.96	66±8.89	0.001
·MAP	105±13.99	89.63±9.28	87.63±8.65	0.001

4. Discussion

In our study, both bolus urapidil plus infusion and urapidil infusion alone resulted in a greater reduction in blood pressure during extubation than remifentanil alone.

Increased stress, catecholamine release, tachycardia, and hypertension can observe during neurosurgery. In particular, during laryngoscopy and intubation, pinholder application, skin incision, dural incision, and extubation, increases in heart rate and blood pressure and may result in sudden and dangerous increases in intracranial pressure. Low-dose hypnotics, opioid analgesics, lidocaine, and adrenergic blockers can suppress the hemodynamic responses during extubation[8,10,11,17,18,25]. Guy et al. compared remifentanil and fentanyl in patients who underwent craniotomy for space-occupying supratentorial lesions[11]. They reported that the effects of both drugs on intracranial and cerebral perfusion pressure were similar. Balakrishnan et al. compared fentanyl and remifentanil with isoflurane in intracranial surgery, and reported that hemodynamic data and side effects were similar in both agents, and extubation was performed faster with remifentanil[12]. Gesztezi et al. reported that an infusion rate of 0.125 µg/kg/min was appropriate for intracranial surgery[1]. In our study, remifentanil was planned to be administered at a dose range of 0.125 - 0.25 µg/kg/min with sevoflurane, but mostly used at a dose of 0.125 µg/kg/min. Nho et al. reported that maintaining a remifentanil infusion (remifentanil maintained at a target organ concentration of 1.5 ng ml-1) reduced the hemodynamic changes and cough associated with tracheal extubation almost without significantly delaying recovery from anesthesia[13]. In addition, Aouad et al. showed that during emergence, the remifentanil infusion (0.014+/-0.011 µg/kg/min) had a significantly lower incidence and less severe coughing compared with the control group (40% vs 80%)[14]. Urapidil has fewer hypotensive and side effects than most antihypertensive agents. The hypotensive effect of urapidil is achieved through a peripheral α1-adrenoceptor blockade and central hypotensive activity, resulting in a reduction in systemic vascular resistance[19,20]. Van Aken et al. show that no change in intracranial pressure or intracranial compliance after the administration of urapidil with or without intracranial hypertension in dogs (50 mg plus an infusion of urapidil 8.2±1.2 mg/min)[21]. There is no consensus in the literature on perioperative doses of urapidil. Mentioned studies report different dosing regimens and their effects. For example, Scafuro et al. found that urapidil administration during induction and preoperatively caused a 25% decrease in MAP[22]. Steib et al. reported a 16% decrease in blood pressure compared to the initial value in cases where they used 0.4 mg/kg urapidil to suppress the cardiovascular response to tracheal intubation[23]. Quéré et al. also found that the decrease in blood pressure was 12%[24]. Hernández-Palazón et al. compared urapidil and lidocaine to prevent cardiovascular responses during laryngoscopy and intubation in patients undergoing intracranial mass surgery, and found that it did not prevent an increase in heart rate[25]. Ye et al. reported that a low dose (0.4 mg/kg) or high dose of urapidil (0.6 mg/kg) could be used under general anesthesia to control fluctuating blood pressure during intubation and extubation[26]. Tauzin-Fin et al. reported the perioperative management of pheochromocytoma with intravenous urapidil to prevent haemodynamic instability[27]. They used a continuous intravenous infusion of urapidil with a stepwise increase in dose (started at 5 mg/h and increased by 1 mg/h every hour) until the onset of dizziness or orthostatic hypotension.

In our literature review, we found that the effects of remifentanil and urapidil on hemodynamic status during extubation have not been previously compared. In our study, it was found that urapidil bolus plus infusion or urapidil infusion alone lowered the blood pressure more than remifentanil infusion. And also, SAP during extubation was higher in Group 1 than in the other groups (respectively; it was determined as 144.20±14.14 mmHg, 116.47±11.60 mmHg, 121.93±11.74 mmHg). It was observed that remifentanil infusion administered at a dose of 0.02-0.03 µg/kg/h alone did not prevent blood pressure increases during extubation. In addition, the SAP values in the first 5 min after extubation were higher in the remifentanil group than in the urapidil group. In Groups 2 and 3, a rapid decrease in DAP was observed from the first minute, followed by a stable course. The mean DAP of the patients until extubation was significantly higher in Group 1. Mean DAP values during extubation were 82.37±12.34 mmHg, 67±10.12 mmHg, 65.33±9.35 mmHg for Group 1, Group 2 and Group 3, respectively. The DAP showed a rapid decrease in Groups 2 and 3 (urapidil groups) from the first minute

after extubation, followed by a stable course. In contrast, the mean DAP of Group 1 remained significantly higher until extubation and continued to increase for 5 min after extubation. The MAP showed a pattern similar to that of systolic and diastolic arterial pressures.

A previous study reported tachycardia in patients administered urapidil, which was believed to be secondary to hypotension[26]. However, in the current study, heart rate values were similar in both groups, and tachycardia was not observed in any patient. Regarding extubation time and extubation quality, it is mentioned that they were similar between the groups, with most patients experiencing extubation without severe coughing or straining.

The Entropy RE values, which indicate the depth of anesthesia, were not significantly different between the groups, indicating that the different drug regimens administered with remifentanil and urapidil had similar effects on extubation time and wakefulness.

This study had some limitations, including being conducted at a single center with a small number of cases. Additionally, the follow-up period was limited to the first 5 min after extubation, and extending the observation time could provide more comprehensive evaluation of the effects of the drugs on intracranial pressure, complications, and postoperative outcomes.

5. Conclusion

Urapidil administered at various doses during intracranial surgery effectively prevents hemodynamic responses secondary to extubation and controls blood pressure without affecting heart rate. In addition, the quality of extubation, extubation time, and wakefulness were similar to those achieved using remifentanil. However, this study highlights the need for larger sample sizes in future research to establish and update standard regimens for hemodynamic control in neuroanesthesia practice.

Statement of ethics

This study was approved by Institutional Review Board (IRB Number:166/11, Date:07/04/2022) and written informed consent was obtained from all patients before enrolment in the trial.

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=qVqOZFj2DwNmvdf1oGFYiAI0XZXQEbFvgHBYPs9i4EGiHVnk8Z1QbJfp02g9U_Ul

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Effects of Controlled Hypotension on Cerebral Oxygenation in Tympanoplasty and Tympanomastoidectomy Surgery

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Abstract

Aim: We aimed to evaluate the effects of controlled hypotension by using esmolol and nicardipine on cerebral oxygenation, hemodynamics, bleeding, surgical satisfaction and quality of recovery.

Methods: Sixty adult patients who were scheduled tympanoplasty and tympanomastoidectomy surgery were included. The mean arterial blood pressure was aimed to be <30% from baseline for controlled hypotension. Nicardipine infusion (1-5 µg/kg/min) was used in group N and esmolol infusion (50-300 µg/kg/min) was used in group E. Near-infrared spectroscopy (NIRS) values, surgical bleeding and surgical satisfaction, extubation and recovery time, postoperative side effects, antiemetic and additional analgesic medications were recorded.

Results: The NIRS values in N group were observed higher than E group at the 20th and 40th minutes on the left, and at the 25th, 30th, 35th, 40th, 45th and 60th minutes on the right ($p<0.05$). Mean arterial blood pressure at the 70th and 80th minutes, and heart rate at the 15th, 25th, 30th, 35th and 40th minutes were observed higher in N group when compared to the E group. In esmolol group, it was observed mild bleeding in 23 patients, moderate bleeding in 7 patients. In nicardipine group, it was observed mild bleeding in 11 patients, moderate bleeding in 18 patients, severe bleeding in 1 patient. Surgeon's satisfaction was higher in the esmolol group ($p<0.05$).

Conclusion: It was concluded that both nicardipine and esmolol could be applied for controlled hypotension during the otologic surgery. Surgical bleeding was less and surgeon's satisfaction was higher with the Esmolol group than the Nicardipine group.

***Keywords**: Esmolol, nicardipine, hypotensive anesthesia, tympanoplasty, tympanomastoidectomy*

1. Introduction

Controlled hypotension is a frequently preferred method in terms of reducing intraoperative bleeding, improving visualization of the surgical field, shortening the operation time, and reducing surgical complications. It is defined as reducing the systolic arterial pressure (SAP) to 70-80 mmHg, reducing and maintaining the mean arterial pressure (MAP) to 50-65, or reducing the initial MAP by 30%.[1-3] Controlled hypotension is preferred in oromaxillofacial surgery, endoscopic sinus, septoplasty, or middle ear microsurgery (tympanoplasty, mastoidectomy), spinal surgery, aneurysm, major orthopaedic surgery, prostatectomy, cardiovascular surgery and liver transplant surgery.[4,5] In middle ear surgery, control of the bleeding is essential and controlled hypotension is minimizing bleeding of surgical field.[6] Vasodilators such as sodium nitroprusside and nitroglycerin, β adrenergic blockers such as propranolol and esmolol, calcium channel blockers such as nicardipine, inhalation anaesthetics such as sevoflurane, isoflurane, desflurane, opioids such as remifentanil and fentanyl can be used for this purpose.[4-11] Esmolol is a highly cardioselective β1-blocker with rapid onset and short duration of clinical effects.[12] Its clearance is not dependent on renal or hepatic function because it is rapidly metabolized by plasma esterases. Nicardipine is another short-acting calcium channel blocker that has been found to be useful in controlling hemodynamics during intubation, intraoperatively, or during extubation.[13] Nicardipine has minimal dromotropic effect and has coronary and cerebral vasodilator activity.[14]

In our study, we aimed to evaluate the effects of controlled hypotension induced by esmolol and nicardipine on cerebral oxygenation, hemodynamics, intraoperative bleeding, surgical satisfaction and recovery in a prospective, randomized, controlled manner in

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patients scheduled for tympanoplasty and tympanomastoidectomy between July 2020 and July 2021. Nevertheless, we hypothesized that nicardipine would have positive effects on cerebral oxygenation.

2. Materials And Methods

Our study was carried out between 10 July 2020 and 10 July 2021 in Cukurova University Balcalı Hospital Central Operating Room. Sixty ASA I-II patients aged between 18-65 years who were to undergo endoscopic tympanoplasty or tympanomastoidectomy surgery were included in the study in a randomized and double-blind method. Written and verbal consents of the patients were obtained. Patients who were ASA III-IV, under 18 years of age, over 65 years of age, obese, pregnant, using anticonvulsant and antiarrhythmic drugs, having cerebrovascular disease, hypertension and cardiovascular problems, pulmonary, renal and hepatic disease, malignancy, a history of bleeding disorders or using anticoagulant drugs, having fever, having active infection and those who did not agree to participate in the study were excluded from the study.

Apfel scoring was used to determine the risk of postoperative nausea and vomiting.[15] PCR test for COVID-19 was performed to all cases two days before the operation. Demographical data of the patients were recorded.

The patients were admitted to the operating room without premedication and after venous access obtained 0.9% NaCl (5-7 ml/kg/hour) infusion was performed. Electrocardiogram (ECG), SAP, diastolic arterial pressure (DAP), MAP, heart rate (HR), peripheral oxygen saturation (SpO2) monitorization were performed to all patients. Non-invasive blood pressure values were measured three times before the induction, and the mean of these values was noted as baseline values. Before the induction of anaesthesia, Near-infrared spectroscopy (NIRS) probes were placed on the bilateral frontal region to measure the cerebral oxygen saturation (INVOS, Covidien, Somanetics, Troy, MI). NIRS values measured from the right and left frontal region were recorded as baseline.

Anesthesia induction was performed with propofol 2-2.5 mg/kg, remifentanil 0.5 µg/kg and rocuronium 0.6 mg/kg. Respiratory rate was adjusted to keep tidal volume of 6-7 mL/kg and end-tidal CO_2 values between 30-35 mmHg in mechanical ventilation. Anaesthesia was maintained with O_2/N_2O mixture 40%/60% and sevoflurane 2%. Low-dose remifentanil (0.03 µg/kg/min) infusion continued till the end of surgery. The depth of anesthesia was adjusted to an end-tidal MAC (EtMAC) value of 1-1.3 MAC. The remifentanil infusion dose was kept constant. Before placing the tympanic membrane graft, N_2O inhalation was stopped and ventilation was provided with O_2/air mixture 40%/60%.

Patients were divided into 2 groups at the 10th minute after induction. Power analysis was not applied in this study, and all patients who underwent tympanoplasty or tympanomastoidectomy surgery in our centre within 1 year were evaluated for eligibility for the study and assigned to groups with the 1-1 method.

Group N (n:30); The group which applied Nicardipine infusion. It was started with 1 µg/kg/min and the dose was increased at 5 minutes intervals until reaching the target is reached, maximum dose was 5 µg/kg/min.

Group E (n:30); The group which applied Esmolol infusion. It was started by 50 mcg/kg/min and the dose was increased at 5 min intervals until the target is reached, maximum dose was 300 mcg/kg/min.

During the operation, hemodynamic data of the patients (SAP, DAP, MAP, HR), SpO_2, $EtCO_2$ right and left cerebral NIRS values were recorded with 5 min intervals. It is aimed that the mean arterial pressure values are 30% less than the baseline values for controlled hypotension. If the mean arterial pressure was higher than the targeted values for more than 5 minutes, it was planned to increase the infusion doses by titration in both groups. If the mean arterial pressure was lower than the targeted value for more than 5 minutes, it was also planned to reduce the infusion drug doses by titration, to administer intravenous bolus fluid. If HR was less than 45 beats/min for more than 2 minutes, it was accepted as bradycardia. it was planned to reduce the drug dose and administered 0.5 mg atropine sulphate intravenous in case of inadequate response.

It was accepted as cerebral desaturation criterion if the reduction of rSO_2 (regional oxygen saturation) was more than 20% from baseline or it was more than 3000 seconds when desaturation time and the product of the rSO_2 value obtained by subtracting the 50 were multiplied. In this case, it was planned to perform same order as Denault et al.[16] (respectively, checking NIRS probes and patients head position; volume replacement and vasopressor administration). In addition, it was planned to increase the NIRS values by increasing FiO_2 and cerebral blood flow by optimizing the end-tidal CO_2 value.

All operations were performed by the same surgeon. Five step bleeding scale was used to check the amount of bleeding in the surgical region during the operation and the amount of bleeding was recorded with this scale.

0: No bleeding
1:Mild bleeding, doesn't require aspiration
2:Mild bleeding, rarely requires aspiration
3:Minor bleeding requires frequent aspiration, the operation site can be seen for a few seconds after the aspiration.
4:Often requires aspiration, operation site can be seen only by means of aspiration
5:Major bleeding, continuous aspiration is required; the surgery can be performed difficultly.

Surgical satisfaction was asked to the surgeon evaluate after the operation. It was evaluated as "poor, fair, good, and excellent". All patients were received tramadol 2 mg/kg as an analgesic at least 30 minutes before end of the operation. Atropine sulfate 0.01-0.02 mg/kg and neostigmine 0.05-0.07 mg/kg were administered intravenously for reversal of neuromuscular blockage.

Patients were extubated when the tidal volume achieve the minimum 3ml/kg and oxygen saturation >96% in room air. Durations of the operation, anaesthesia, extubation time and recovery time of all patients were recorded. It was planned to administer intravenous ondansetron in case of persistent, moderate or severe nausea and vomiting in PACU (Post-anaesthesia Care Unit). The patients' length of stay in PACU and possible side effects (hypotension, hypertension, nausea, vomiting, insufficient analgesia, etc.) were recorded. Patients were evaluated according to the Postoperative Modified Aldrete scoring system. Paracetamol (1000 mg) was administered intravenously as a rescue analgesic to the patients when the visual analogue scale >4 in PACU. Patients with an Aldrete score >9 were sent to the Ear-Nose-Throat service.[17]

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Institutional Review Board on 3th July, 2020 (approval number: 101)

2.1. Statistical analyses

SPSS (Statistical Package for the Social Sciences) 23.0 package program was used for the statistical analysis of the data. Descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum) were used in the evaluation the research data. Shapiro-Wilk test was used to find if the continuous measurements conform to normal distribution. Mann-Whitney U test was used for the comparison of two groups of data not showing normal distribution. Pearson Chi-Square test, Fisher-Freeman-Halton Exact test and Fisher's Exact test were used in the comparison of categorical expressions. Statistical significance level was taken as 0.05 in all tests.

3. Results

There was no statistically difference in demographic data (age, gender, body weight, ASA scores) (p>0.05) Demographical and recovery data were presented in Table 1. It was seen that the SAP values at the 70th minute (p=0.045) and the DAP values at the 15th minute (p= 0.013) and 75th minutes (p=0.021) were higher in the Group N than in the Group E (p=0.045). In the Group N, it was determined that the target MAP was reached in a later period after the infusion. Mean arterial pressure values in the Group N were higher at the 15th minute (p=0.024), at the 70th minute (p=0.025) and 80th minute (p=0.045) than in the Group E (p<0.05). Nicardipine dose was increased up to maximum 4µg/kg/min in order to reach the target MAP in the patients. Systolic and mean arterial blood pressures during anesthesia was presented in Figure 1. It was found that this dose was up to maximum 120µg/kg/min in the Group E. Severe hypotension (MAP <55 mmHg) was observed in six patients in both groups. Intravenous bolus of norepinephrine (4 µg) was administered to these patients. A second bolus dose was required in 2 patients in the Group E and in 1 patient in the Group N. No patients required norepinephrine infusion. HR values at 15th, 25th, 30th, 35th and 40th min in the Group N were higher than in the Group E. (p=0.026, p=0.031, p=0.032, p=0.026, p=0.011) Intraoperative heart rates were presented in Figure 2. The incidence of bradycardia and hypotension in the groups were presented in Table 2.

Table 1

Demographical and Recovery Data

	Group E (n=30) (n, %)	Group N (n=30) (n, %)	Total (n=60) (n, %)	p
ASA				
I	12 (40)	18 (60)	30 (50)	0.121
II	18 (60)	12(40)	30 (50)	
Gender				
M	16 (53.3)	17 (56.7)	33 (55)	0.795
F	14 (46.7)	13 (43.3)	27 (40)	
Age (year, min-max)	48 (19-69)	45.5 (18-67)	47 (18-69)	0.450
Body weight (kg, min-max))	76 (51-100)	73.5 (55-114)	74 (51-113)	0.258
Duration of Anaesthesia	87.5 (50-212)	85 (40-185)	85.5 (40-212)	0.668
Duration of Surgery	81.5 (46-200)	79 (35-178)	80 (35-200)	0.706
Duration of Extubation	3 (1-10)	3 (1-6)	3 (1-10)	0.634
Duration of Recovery	3 (1-7)	3 (1-10)	3 (1-10)	0.312
Duration of staying in PACU	18.5 (10-30)	20 (15-30)	20 (10-30)	0.108
Postoperative Aldrete Recovery Score	10 (9-10)	10 (9-10)	10 (9-10)	0.394

*Data presented as number and percentage, Med: Median, Min: Minimum, Max: Maximum Mann Whitney u test, * p<0.05*

The left NIRS values of the groups at the 20th and 40th min and the right NIRS values at the 25th, 30th, 35th,40th,45th and 60th min was found significantly higher in the Group N than in the Group E. There was no statistically significant difference between the groups in the NIRS values at other times measured (p>0.05). Right and left NIRS values during anesthesia were presented in Figure 3.

Mild surgical bleeding which did not and rarely required aspiration (score 1 and 2) was observed in 23 patients in the Group E and 11 patients in the Group N.

Minor bleeding which required frequent aspiration and operation site could be seen for a few seconds after the aspiration (score 3) was observed 7 patients in Group E and 18 patients in the Group N. Bleeding which required frequent aspiration and in operation site could only be seen by means of aspiration (score 4) was observed in 1 patient in the Group N.

Surgical satisfaction was evaluated by the surgeon who performed the surgery. The rate of surgical satisfaction as "good and excellent" was higher in the Group E (38.33%) than in the Group N (18.34%) (p=0,003).

Table 2

The Incidence of Bradycardia and Hypotension in the Groups

	Group E (n=30)	Group N (n=30)	Total (n=60)	p
	n(%)	n(%)	n(%)	
Bradycardia				
Yes	2(6.7)	0(0)	2 (3.3)	0.150
Hypotension				
No	9 (30)	6 (20)	15 (25)	0.371

Table 3

Perioperative Data about Nausea and Vomiting

	Group E (n=30)	Group N (n=30)	Total (n=60)	p
	n(%)	n(%)	n(%)	
Apfel Score				
Low risk	6 (20.3)	4 (13.3)	10 (16.7)	0.530
Moderate risk	15 (50)	13 (43.3)	28 (46.7)	
High risk	9 (30.0)	13 (43.3)	22 (36.7)	
Postoperative Nausea and Vomiting				
No	13 (43.3)	18 (60)	31 (51.7)	0.219
Mild	15 (50)	11 (36.7)	26 (43.3)	
Moderate	2 (6.7)	0 (0)	2 (3.3)	
Severe	0 (0)	1 (3.3)	1 (1.7)	
Antiemetic				
Yes	9(30)	10(33.3)	19(31.7)	
No	21(70)	20(66.7)	41(68.3)	NA

** p<0,05, chi-square test, NA: p value could not be calculated.*

Figure 1

Systolic and Mean Blood Pressures in Groups Gr E= Group Esmolol, Gr N= Group Nicardipine

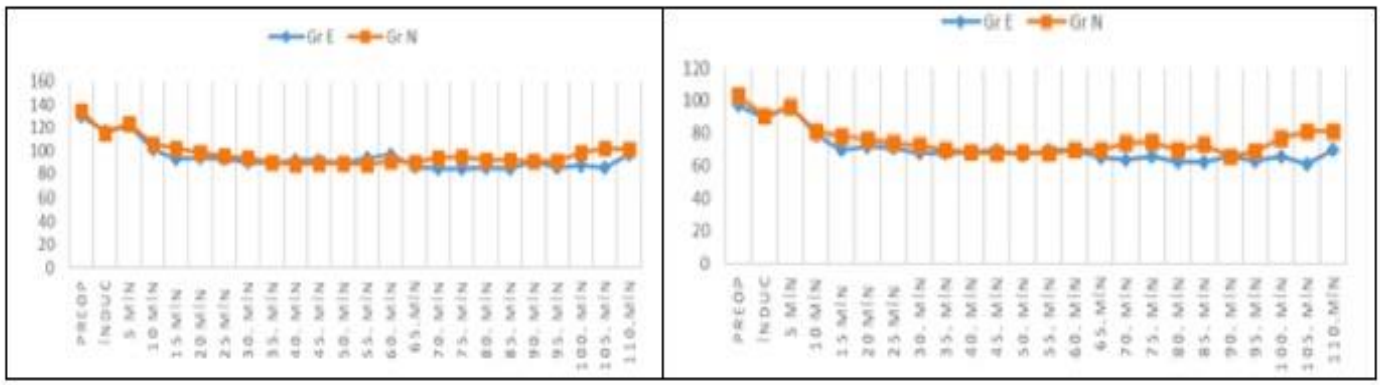


Figure 2

Heart Rates during Anesthesia Gr E= Group Esmolol, Gr N= Group Nicardipine

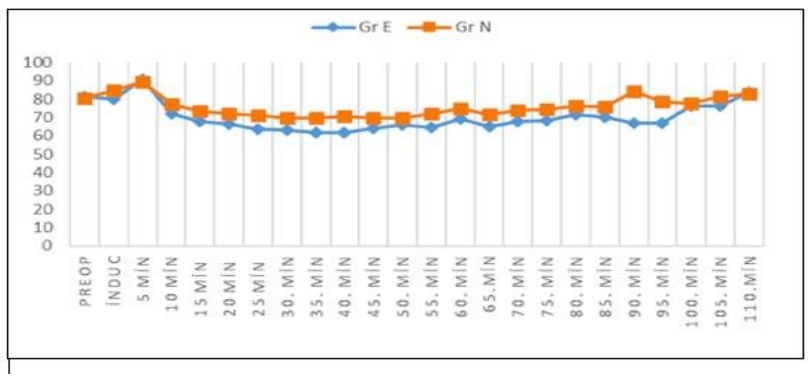
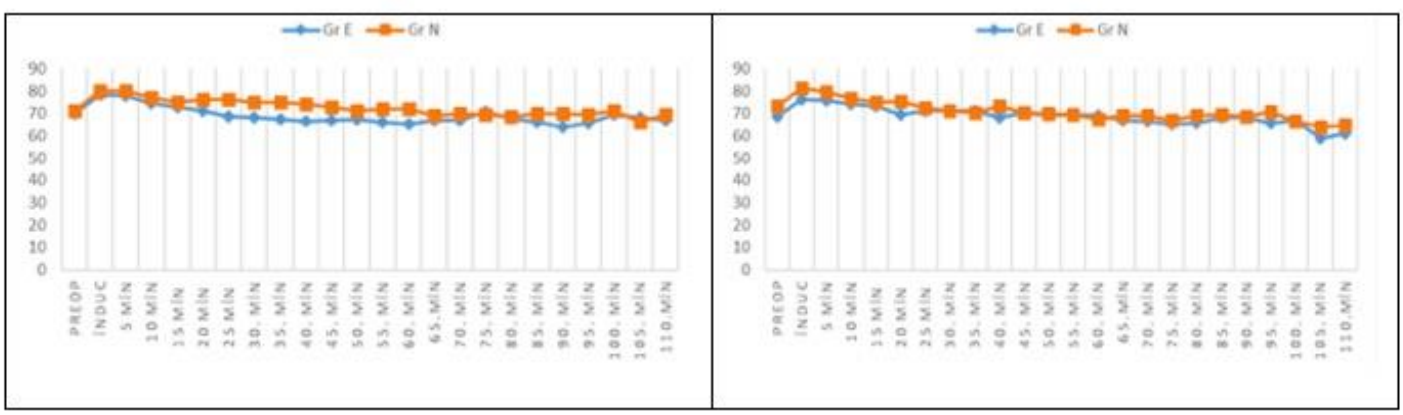


Figure 3

Right and Left NIRS values during Anesthesia Gr E= Group Esmolol, Gr N= Group Nicardipine, NIRS= Near İnfrared spectroscopy



There was no significant difference between the anaesthesia and surgery durations, extubation time, recovery time, length of staying in the recovery room and postoperative Modified Aldrete Scores of the groups. Severe bradycardia was observed in two patients in the Esmolol group. No difference was observed between two groups in terms of postoperative hypotension (p>0.05). Five patients in each group required additional analgesic (paracetamol 1000 mg). Mild postoperative nausea and vomiting were observed in 15 patients in the Esmolol group and in 11 patients in the Nicardipine group. Moderate nausea and vomiting were observed in 2 cases in the Esmolol group, and severe nausea and vomiting were observed in 1 case in the Nicardipine group. (Table 3) Antiemetic (ondansetron 4 mg) was administered to 9 patients in the Group E and 10 patients in the Group N (p>0.05).

4. Discussion

In our study, we investigated to the effect of nicardipine and esmolol on cerebral oxygenation, hemodynamics, bleeding in the surgical region, surgeon satisfaction and recovery during hypotensive anesthesia. We measured higher NIRS values in patients receiving nicardipine than in those receiving esmolol, but we did not observe cerebral desaturation in any patient. Additionally, we found that esmolol can provide better hemodynamic stability, surgeon satisfaction and less surgical bleeding during hypotensive anesthesia in endoscopic tympanoplasty and tympanomastoidectomy surgery. It is not clear about what the target value is in controlled hypotension. Erdem et al.[18] aimed MAP as 50-60 mmHg in ASA I patients who underwent rhinoplasty. Degaute et al.[10] accepted systolic blood pressure of 80 mmHg as the target in 30 ASA I-II patients in their study on tympanoplasty surgery and reported that combination of propofol and remifentanil reduces middle ear blood flow, provides better surgical vision and is a good option for creating hypotension in tympanoplasty surgery.

In various studies, it was shown that the volume of bleeding was less in the hypotension group compared to the normotensive group. Kol et al.[19] reported that esmolol or dexmedetomidine limit the volume of bleeding in operation side in desflurane anaesthesia. Salman et al.[20] observed that esmolol provides better surgical bleeding control and less blood and fluid replacement.

In our study, hemodynamic parameters were found to be similar, except that the MAP values were higher at the 15th, 70th and 80th minutes and the heart rate was higher at the 15th, 25th, 30th, 35th and 40th minutes in the Group N. We attributed this result to nicardipine vasodilation effect. Besides heart rates were higher in Group N than Group E, we assumed that this result is conclusion of stimulation of the sympathetic nervous system with Nicardipine.[21] Hypotension, haemorrhage, ischemia, pH imbalances, and temperature variables can greatly affect tissue oxygenation. It is important to remember that tissue perfusion may not correlate with changes in blood pressure and maintain the oxygenation of the brain tissue during controlled hypotension. Evidence suggests that cerebral tissue desaturation may occur undetected in the presence of normal vital signs. Therefore, it is important to monitoring of brain tissue oxygenation during the hypotension. One of the best indicators of cerebral perfusion is NIRS monitoring which shows regional brain tissue oxygenation.[22-28] Low values always mean a failure of brain perfusion and oxygenation and increased oxygen demand. Cox et al.[29] reported that the desaturation is correlated with intraoperative blood pressure in shoulder arthroscopy performed on sitting position.

Shear et al.[30] reported that controlled hypotension range of 55-65 mmHg has no effect on regional cerebral oxygen saturation in pediatric patients. Similarly, Salman et al.[20] emphasized that controlled hypotension induced by esmolol does not affect regional cerebral oxygen saturation in myomectomy operation. Erdem et al.[18] consider a decrease of more than 20% in cerebral oxygenation as desaturation in rhinoplasty surgery. Besides, Al-Rawi et al.[31] showed that a 13% decrease in saturation is an indicator of cerebral ischemia.

In our study, it was found that right and left cerebral oxygenation is preserved in both groups during controlled hypotension induced by Esmolol and Nicardipine. It was determined that NIRS values were higher in the nicardipine group during periods of high heart rate. This result was thought to be related to the increased heart rate, myocardial contractility, cardiac output and cerebral blood flow due to Nicardipine. No desaturation was observed in NIRS measurements. This was accepted as the preservation of cerebral perfusion.

There are studies in the literature suggesting that Nicardipine increases surgical bleeding. Hersey SL et al.[32] reported that nicardipine caused more bleeding than nitroprusside in spinal fusion surgery (761 +/- 199 mL and 1297.5 +/- 264 mL). In our study, it was observed bleeding that required frequent aspiration in 7 patients in the Group E and in 18 patients in the Group N a major bleeding that required frequent aspiration in 1 patient in the Nicardipine group. This result was associated with the vasodilation effect of Nicardipine. At the same time, surgical satisfaction was determined better (good and very good) in esmolol group. We thought it is because of the provision of a bloodless surgical field.

The groups were comparable in terms of anesthesia, surgery, extubation and recovery times. In the early postoperative period, bradycardia was encountered in two patients in the esmolol group.

There were some limitations of the present study. Firstly, our study was conducted during the COVID-19 pandemic. Therefore, it was carried out with a limited number of patients. The study could have been conducted with a larger group of patients. Second, arterial blood pressures could have been followed by placing arterial line but it was not performed because of overcosting. Third, intraoperative and postoperative urine follow-up and renal functions of the patients could have been monitored. Fourth, comparisons could be made by choosing non-medicated normotensive patients as the control group.

5. Conclusion

In conclusion, it was considered that both nicardipine and esmolol can be administered in controlled hypotension in sevoflurane-remifentanil anesthesia, cerebral oxygenation was maintained at applied nicardipine or esmolol doses and no desaturation was observed. Esmolol caused less surgical bleeding and more surgical satisfaction than nicardipine. The monitoring rSO2 with NIRS technology may be a valuable tool to assess the controlled hypotension on adult patients having tympanoplasty and tympanomastoidectomy surgery.

Statement of ethics

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Institutional Review Board on 3th July, 2020 (approval number: 101)

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=v7BkNnnepTnbhn8rNR77La_VD6-jPmtvIG0rNuBFypVXZTzHzCYL8bv3QE832R_a

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Risk factors for late pneumothorax in patients with minor rib fractures after blunt chest trauma

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Abstract

Aim: Traumatic pneumothorax is a preventable cause of death in trauma patients. Treatment of small traumatic pneumothorax without respiratory distress is controversial. In this study, we tried to determine the risk factors for the development of late traumatic pneumothorax and the safety of treatment with observation in appropriate patients.

Methods: Between August 2020 and December 2023, 167 patients admitted to the emergency department for blunt chest trauma with less than four rib fractures were retrospectively analyzed. Age, gender, mechanism of trauma, number of rib fractures, rib fracture location, concomitant traumas and pulmonary complications were recorded.

Results: The study included 167 patients. There were 107 males (%) and 60 females (%). The age of the patients ranged from 17 to 89 years (mean, 52.6 years). Early pneumothorax was seen in 10 patients (0.59%) and late pneumothorax in nine patients (0.53%). In statistical analysis, there was a significant correlation between late pneumothorax and the number of rib fractures (p=0.001) and subcutaneous emphysema (p=0.023). There was no significant association between late pneumothorax and other parameters.

Conclusion: Increased number of rib fractures and pulmonary complications are harbingers of traumatic pneumothorax. Observation is an adequate treatment modality in late pneumothoraxes without respiratory distress and radiologic progression.

***Keywords**: Blunt trauma, late pneumothorax, risk factors*

1. Introduction

Chest trauma accounts for 10% to 15% of all trauma and is the cause of death in 25% of all trauma-related deaths.[1] After major trauma, the incidence of traumatic pneumothorax has been reported to be higher than 20% .[2] Traumatic pneumothorax is a preventable cause of death in trauma patients. The treatment of small traumatic pneumothorax not accompanied by respiratory distress is controversial. Although simple interventions such as percutaneous tube thoracostomy can be life-saving, such procedures can be associated with significant morbidity when managed by personnel without appropriate training in trauma.[3] Although small primary spontaneous pneumothorax can be managed conservatively, the safety of close observation for late traumatic pneumothorax is questionable. In this study, we tried to determine the risk factors in the development of traumatic late pneumothorax and the reliability of observation in appropriate patients.

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https://doi.org/10.36516/jocass.1461296

2. Materials and Methods

Between August 2020 and December 2023, 167 patients admitted to the emergency department for blunt chest trauma with less than 4 rib fractures were retrospectively analyzed. Age, gender, mechanism of trauma (motor vehicle accident, falling from high, assault or pedestrian injury (automobile-pedestrian or automobile-bicycle injury), number of rib fractures, rib fracture location, concomitant traumas and pulmonary complications (pneumothorax, hemothorax, hemopneumothorax, pulmonary contusion and subcutaneous emphysema) were recorded.

Direct chest radiography is ordered for all patients admitted to the trauma department of the hospital emergency outpatient clinic, and thoracic computed tomography is performed in patients with suspected lung parenchymal pathology or mediastinal pathology. Thorax computed tomography was performed in 124 of the 167 patients included in the study (Figure 1 and 2). No significant difference was observed in terms of pneumothorax in any of the 124 patients who underwent thorax CT. However, different clinical features were detected in 32 patients in terms of rib fracture and lung contusion. Radiologic examinations related to other systems are ordered and evaluated by the emergency physician or the relevant clinical specialist according to the history and physical examination. Pneumothorax detected in the emergency department is considered

early pneumothorax, while pneumothorax occurring after hospitalization is defined as delayed pneumothorax. Tube thoracostomy was performed by thoracic surgeons in the emergency department. Tube thoracostomy was performed on symptomatic patients with moderate and high degree pneumothorax. Patients with mild pneumothorax were followed up.

Figure 1

Image of right traumatic pneumothorax in thorax computed tomography coronal section.

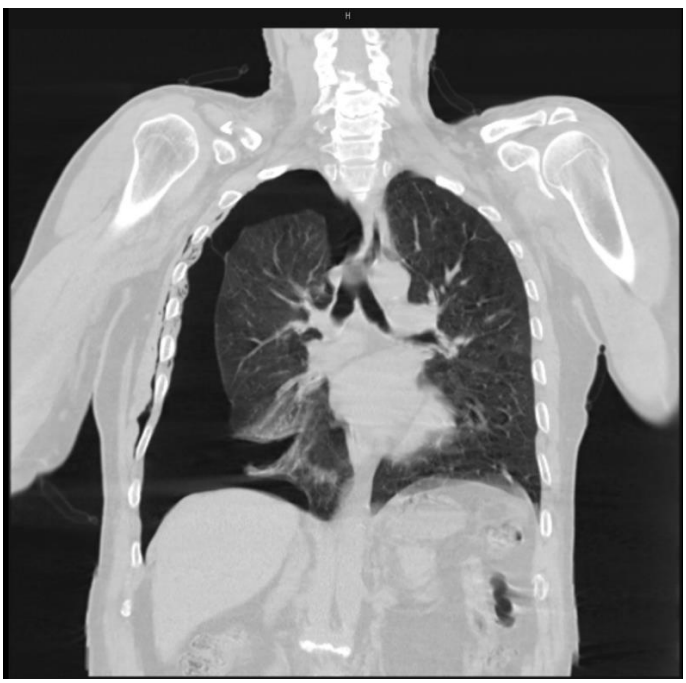
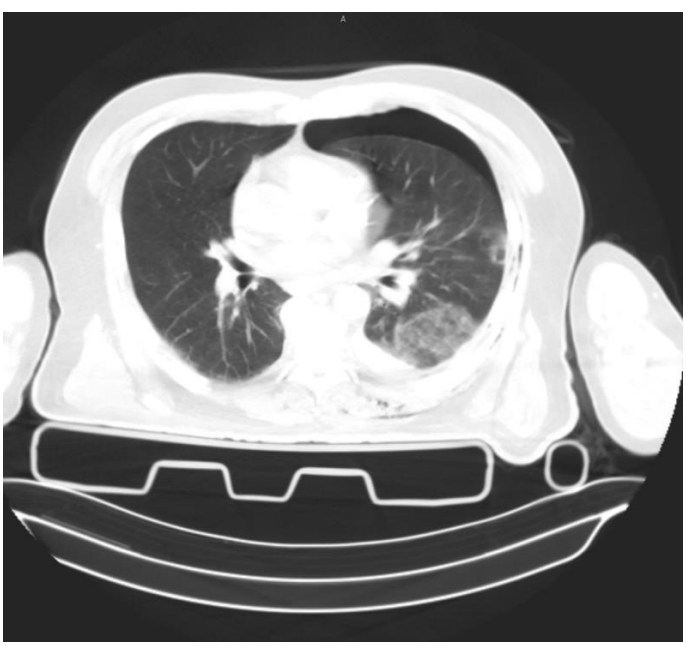


Figure 2

Image of left traumatic pneumothorax in thorax computed tomography sagital section.



SSPS 20.0 statistical software (IBM-SPSS Inc., Chicago, IL, USA) was used to analyze the data obtained in the study. Chi-square test was used to compare categorical variables in statistical analyses. Student's T test was used to compare continuous variables between two groups. In the study, $p<0.05$ was taken as the limit of statistical significance.

3. Results

The study included 167 patients. 107 patients were male (%) and 60 were female (%). The age of the patients ranged from 17 to 89 years (mean, 52.6 years). Early pneumothorax was seen in 10 patients (0.59%) and late pneumothorax in 9 patients (0.53%). The clinical characteristics of patients with blunt chest trauma are shown in Table 1.

Table 1

Clinical characteristics of patients with blunt chest trauma

Features		n (%)
Age (average, years)		52.4 (19-86)
Gender	· Female · Male	60 (35.9) 107(64)
Trauma mechanism	· Motor vehicle accident · Falling from high · Assault · Pedestrian accident	97(58) 44(26.3) 16(9.5) 9(5.3)
Number of rib fracture	· 1 · 2 · 3	47(28.1) 69(41.3) 51(30.5)
Rib fracture side	· Right · Left · Bilateral	89(53.2) 67(40.1) 11(6.5)
Rib fracture localization	· 1st – 3rd rib · 4th – 9th rib · 10th – 12th rib	33(19.7) 114(68.2) 20(11.9)
Pulmonary complication	· Early pneumothorax · Hemothorax · Hemopnemothorax · Contusion · Subcutaneous emphysema	10(5.9) 21(12.5) 7(4.1) 36(21.5) 18(10.7)
Late stage pneumothorax		9(5.3)
Isolated chest trauma		56(33.5)
Concomitant trauma	· Head trauma · Extremity trauma · Abdominal trauma · Facial trauma · Scapula/clavicula fracture	40(23.9) 32(19.1) 18(10.7) 12(7.1) 9(5.3)
Length of hospital stay (Mean, days)		6,36 (3-17)

Of the 10 patients who initially presented with early pneumothorax, 7 (70%) underwent tube thoracostomy and 3 (30%) were placed on observation. None of the patients in the observation group required further intervention. Late pneumothorax was detected in 9 (5.3%) patients. Late pneumothorax was most common in the first 2 days (mean 2.3 (1-7) days).

Tube thoracostomy for drainage was performed in 6 (66.6%) of these 9 patients, while observation was sufficient in 3 (33.3%). The

indication for tube thoracostomy was respiratory distress in 4 patients and progressive increase in pneumothorax during follow-up in 2 patients. The mean duration of chest tube follow-up was 4.7 (2-7) days. Clinical findings of patients with late pneumothorax are shown in Table 2. The mean hospitalization period of all patients was 6.36 (3-17) days. Due to traumas accompanying blunt thoracic trauma, spleen laceration repair in 2 patients and colon and diaphragm rupture repair in 1 patient were performed by the general surgery clinic, and lower extremity surgery in 5 patients, upper extremity surgery in 3 patients, and clavicle surgery in 2 patients were performed by the orthopedics clinic. The mean duration of hospitalization in patients with late pneumothorax was 8.93 (5-15) days. Mortality was 1.79% (n = 3/167). Statistically, there was a significant association between late pneumothorax and the number of rib fractures (p=0.001) and subcutaneous emphysema (p=0.023). There was no significant association between late pneumothorax and other parameters.

Table 2

Risk factors affecting late pneumothorax

	Late pneumothorax n (%)	p
Trauma mechanism		
· Motor vehicle accident	5 (55.5)	0.530
· Falling	2 (22.2)	
· Assault	1 (11.1)	
· Pedestrian accident	1 (11.1)	
Number of rib fracture		
· 1	1 (11.1)	0.001
· 2	2 (22.2)	
· 3	6 (66.6)	
Rib fracture localization		
· 1st – 3rd rib	2 (22.2)	0.875
· 4th – 9th rib	5 (55.5)	
· 10th – 12th rib	2 (22.2)	
Rib fracture side		
· Right	5 (55.5)	0.650
· Left	3 (33.3)	
· Bilateral	1 (11.1)	
Pulmonary complication		
· Early pneumothorax	2 (22.2)	0.023
· Hemothorax	0	
· Hemopnemothorax	7 (77.7)	
· Contusion	0	
· Subcutaneous emphysema	0	
Concomitant trauma		
· Head trauma	3 (33.3)	0.985
· Extremity trauma	1 (11.1)	
· Abdominal trauma	0	
· Facial trauma	3 (33.3)	
· Scapula/clavicula fracture	0	

4. Discussion

Traumatic pneumothorax is a preventable cause of death. The incidence of traumatic pneumothorax after major trauma is reported to be more than 20%.[2] In our study, traumatic pneumothorax was seen in 19 of our patients (11.36%). The incidence of early pneumothorax was 5.98% (10/167) and the incidence of late pneumothorax was 5.38% (9/167). According to the recommendation of The American College of Surgeons Committee, the treatment of traumatic pneumothorax is observation and/or tube thoracostomy in patients at risk of conversion to life-threatening tension pneumothorax.[4] Because of the risk of tension pneumothorax in traumatic pneumothoraxes, the idea of performing tube thoracostomy even if the amount of pneumothorax is small is common, especially in patients who are intubated or who will receive general anesthesia. However, the need for tube thoracostomy in small pneumothoraxes is controversial. Although tube thoracostomy is considered a relatively simple procedure, it may have a complication rate of up to 30%.[5] Deneuville reported that the risk of complications increased 10-fold in tube thoracostomies performed by physicians other than thoracic surgeons and physicians undergoing specialized training.[3] Therefore, routine tube thoracostomy in traumatic pneumothorax without respiratory distress or pneumothorax progression is controversial. In our study, 3 (30%) of 10 patients with early pneumothorax and 3 (33.3%) of 9 patients with late pneumothorax were treated with tube thoracostomy without progression in clinical findings and radiologic follow-up.

Tube thoracostomy was performed in 6 of 9 patients with late pneumothorax. Indications for tube thoracostomy were respiratory distress in 4 patients and radiologic progression of pneumothorax in 2 patients. The mean follow-up period of chest tube was 4.7 (2-7) days. Late pneumothorax was most common in the first 2 days (mean 2.3 (1-7) days). In 3 of 9 patients with late pneumothorax, observation and oxygen support were sufficient without further intervention. Misthos et al.[6] reported 14 cases of late pneumothorax and 57.1% (8 cases) of them were treated with observation. Our results and the results of other studies in the literature [7,8] suggest that routine chest tube placement is not necessary in all traumatic pneumothorax.

The mean hospital stay of all patients was 6.36 (3-17) days. The mean length of hospital stay in patients with late pneumothorax was 8.93 (5-15) days. Although no adverse outcome was recorded in late pneumothoraxes followed up with observation, hospital stay was longer in these patients. We attributed the longer hospital stay in patients with late pneumothorax to more rib fractures and tube thoracostomy follow-up.

Lung parenchymal lesions in pneumothorax are usually caused by rib fractures. As in our study, the risk of pneumothorax increases with the number of rib fractures. Since air leakage is usually low in small lacerations of the lung, it is highly probable that pneumothorax is not seen on direct chest radiographs taken at inspiration. PA chest radiographs ordered by clinicians are taken by radiology technicians at the end of a deep inspiration regardless of the etiology. In fact, a PA chest radiograph taken at expiration is more sensitive in visualizing small pneumothoraxes. We believe that PA chest radiographs of all patients with blunt thoracic trauma should be taken at expiration, which has an important role in diagnosis and treatment. Therefore, it would be appropriate to inform radiology technicians about this issue. Although Thoracic Computed Tomography has been proven to be an important diagnostic tool in revealing pneumothorax, its effect on treatment has been found to be only 0.9%.[9] Therefore, in patients with minor blunt thoracic trauma, PA chest radiography performed at expirium is both cost-effective and diagnostically adequate radiologic examination.

In conclusion, increased number of rib fractures and pulmonary complications are harbingers of traumatic pneumothorax. Observation is an adequate treatment method in late pneumothoraxes without respiratory distress and radiologic progression.

Statement of ethics

This study was approved by Institutional Review Board (Konya City Hospital IRB Number:04-46, Date:2024) and written informed consent was obtained from all patients before enrolment in the trial.

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Is Rectal Diameter a Predictor of Daytime Urinary Incontinence in Pediatric Patients?

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Abstract

Aim: With this study, we aimed to evaulate the relationship between daytime urinary incontinence and transverse rectal diameter by using transabdominal ultrasound.

Methods: In this study, pediatric patients were evaluated with symptoms of daytime urinary incontinence referred to the pediatric nephrology clinics of Adıyaman University Faculty of Medicine between November 1, 2022 and January 1, 2023. This observational, cross-sectional study was carried out after obtaining ethics approval. The Dysfunctional Voiding Symptom Score developed by the International Children's Continence Society was used for the diagnosis of lower urinary tract symptoms. Patients with a The Dysfunctional Voiding Symptom Score of ≥9 points were considered as having lower urinary tract symptoms. Transvers rectal diameter measurement was obtained behind the bladder in the axial plane from the outer wall to the outer wall of the rectum. The patients were assessed by the same radiologist. Control group consisted of healthy patients without lower urinary tract symptoms.

Results: A total of 77 children were included in the study. The daytime urinary incontinence group included 39 children (19 boys, 20 girls), while the control group included 38 (16 boys, 22 girls) healthy children. There was no statistically significant difference between the patient group with daytime urinary incontinence and healthy control group when compared in terms of transverse rectal diameter measurements (p=0.387, t=0.870). There was no association between transverse rectal diameter and daytime urinary incontinence (p>0.05).

Conclusion: Our data suggest that increased rectal diameter is not the only predisposing factor for daytime urinary incontinence and neural mechanisms such as cross-organ sensitization are also may be effective in daytime urinary incontinence.

***Keywords**: Children, daytime urinary incontinence, transverse rectal diameter, transabdominal ultrasound.*

1. Introduction

Dysfunctional voiding symptoms are common in childhood and account for a substantial number of referrals to the pediatric nephrology and urology outpatient clinics. They are treatable conditions but can adversely affect quality of life and lead to psychiatric problems when left untreated.[1] Daytime urinary continence is expected to be achieved by 4 years of age, and nighttime urinary continence is attained by 5 to 7 years of age. In children, coordination between the urinary sphincter and bladder improves by increasing age and the frequency of urinary daily incontinence declines.[2]

Corresponding Author: Günes Isık, drgunes07@hotmail.com, *Received: 27.10.2024, Accepted: 26.12.2024, Available Online Date: 31.12.2024 Cite this article as: Işık G, Oktay C, Yavuz S. Is Rectal Diameter a Predictor of Daytime Urinary Incontinence in Pediatric Patients? J Cukurova Anesth Surg. 2024; 7(4): 239-42.*
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Assessment of voiding disorders is based on the classification of the International Children's Continence Society (ICCS) guidelines, which categorizes voiding disorders into daytime urinary incontinence and nocturnal enuresis.[3] Non-organic (functional) daytime urinary incontinence is defined as intermittent urine leaking during non-sleeping periods. To meet this definition, the patient must be at least 5 years old, with urinary incontinence symptoms occurring more than once a month for at least 3 months and organic reasons need to be excluded. According to the ICCS classification, the common types of functional daytime urinary incontinence include overactive bladder, urge incontinence, underactive bladder with voiding postponement, and dysfunctional voiding associated with detrusor sphincter dyscoordination. Amongst others, the rare forms include stress incontinence, giggle incontinence and vaginal reflux. [3] Evaluation of the patients should include detailed history, family history, physical examination, the types and duration of symptoms experienced, and urine volume, urination frequency, capacity of voiding volume, symptoms of feeling urgency and incontinence frequency

and daily totally fluid intake noted by three days voiding diary. [4]

Abreu et al.[5]s used transabdominal ultrasonography to measure rectal diameter and defined an enlarged rectum for transverse diameter ≥3 cm. Functional constipation (FC) affects the quality of life in children and their parents. It is a common complaint and its incidence varies between 0.7% and 29.6%. [6] Constipation and increased transverse rectal diameter are associated with reduced bladder capacity and urinary urgency due to increased pressure on the bladder, and trigger voiding disorders by disrupting detrusor function. This condition, defined as bladder and bowel dysfunction (BBD), is a known entity. Pelvic floor dysfunction causes recurrent urinary tract infections, voiding disorders and constipation in children, especially in girls. [5,7] We think that measurement of the transverse rectal diameter (TRD) by transabdominal ultrasound in children may provide valuable information on the physiology of urinary incontinence and help predicting its occurrence. The aim of our study was to determine whether the TRD has an effect on the physiology of daytime urinary incontinence or not. Early diagnosis and treatment of daytime urinary incontinence in children is essential because of its negative effects on children's self-esteem and quality of patient and their parent's life .[8]

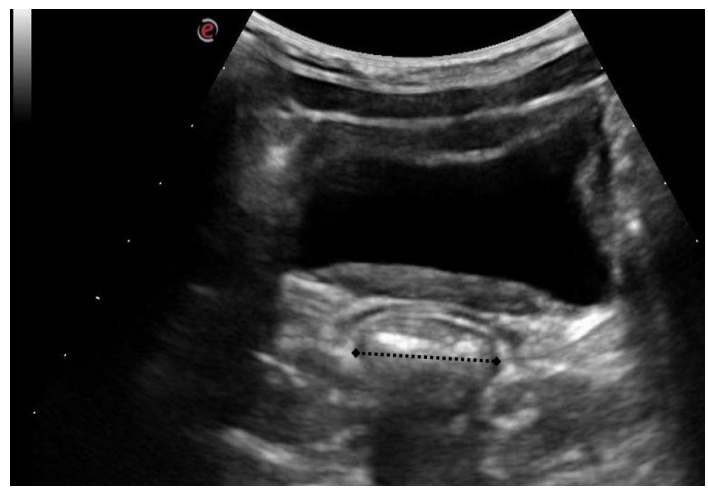
2. Materials and Methods

In our study, pediatric patients who applied to the Department of Pediatric Nephrology, in Adıyaman University Hospital between 1 November 2022 and 1 January 2023 with complaints of daytime urinary incontinence were evaluated prospectively after obtaining ethical approval. All patients were examined for lower urinary tract symptoms and day time urinary incontinence by a pediatric nephrologist. The Dysfunctional Voiding Symptom Score (DVSS) developed by the ICCS and validated by Akbal et al. [3,9] for Turkish children was used for the diagnosis of voiding disorders. Additionally, in all patients, urine volume, urination frequency, capacity of voiding volume, symptoms of feeling urgency and incontinence frequency and daily totally fluid intake noted by three days voiding diary. Complete urinalysis and urine culture were used to rule out active urinary tract infections. The DVSS questionnaire was applied by patients and their parents. Only the patients with daytime urinary incontinence (symptoms of overactive bladder, abnormalities in the filling phase of the bladder, urgency, frequent urination and wetting without nighttime incontinence) were included in the study. Those with an underlying chronic kidney and bladder disease and congenital anomalies of the kidney and urinary tract were not included to the study. Patients having voiding postponement supporting underactive bladder, urine leaking because of decreased urination frequency, giggle incontinence and vaginal voiding were excluded. Conditions that may cause voiding disorders such as attention-deficit hyperactivity disorder, mental retardation and autism spectrum were also excluded. Patients with chronic constipation were not included in the study. Patients with The Dysfunctional Voiding Symptom Score of ≥9 points were considered as having lower urinary tract symptoms. Patients underwent transabdominal ultrasonography for measurement of the transverse rectal diameter. For all patients, TRD was measured by the same radiologist with seven years of professional experience. The healthy control group consisted of completely healthy children without dysfunctional voiding disorders.

Rectal diameter measurement was obtained as described by Klijn et al.[10] Transabdominal ultrasound (US) examination was performed in supine position, using a convex probe (7.5 MHz). The probe was placed over the anterior abdominal wall approximately 2 cm above the symphysis. For the measurement of the transverse rectal diameter, the probe was angled approximately 15° downward from the transverse plane while the vesica was moderately full (30-70% of age-adjusted capacity) (**Figure 1**). Age-adjusted capacity (mL) was estimated using the ICCS formula: [(age in years +1) ×30] .[3] Rectal diameter measurement was obtained behind the bladder in the axial plane from the outer wall to the outer wall of the rectum. The measurements of rectal diameter were repeated three times for all participants and the average value was included in the statistical analysis. Prior to US examination, all children were questioned about the sensation of defecation and those with urge to defecate were excluded from the study. For avoiding bias, the radiologist was blinded to clinical findings of patients throughout the evaluation.

Figure 1

Measurement of the transverse rectal diameter.



2.1. Statistical analyses

Statistical analyses were performed to assess the transverse rectal diameter in children with or without daytime urinary incontinence. The normal distribution of the results for continuous variables was checked using Kolmogorov-Smirnov test. Based on the results of the normality test, Mann-Whitney U test was used to compare two groups in terms of age, and other continuous variables were examined using the independent samples t-test. Intra-rater agreement for the measurements was investigated using Pearson's correlation analysis. Statistical analyses were carried out using SPSS version 23.0, and the accepted level of statistical significance was determined to be $p<0.05$.

3. Results

A total of 77 children were included in the study. The daytime urinary incontinence group included 39 children (19 boys, 20 girls), while the control group included 38 (16 boys, 22 girls) healthy children. The median age was 9 (5-13) in the patient group and 9 (5-14) years in the control group. In our study, 51.3% of the patients were female and 48.7% were male, and 42.1% of the control subjects were female and 57.9% were male. Demographic characteristics and US measurements of the participants are shown in **Table 1**. Frequencies and characteristics of lower urinary tract symptoms in patients are shown in Table 2. The most common complaints in children with voiding dysfunction were urgency 69.2%), enuresis (51.2%), squatting (38.4%) and urinary inkonti-

Table 1

The characteristics and measurements of TRD in groups.

	Patients (n=39)	Controls (n=38)	p
Age*, years	9 (5-13)	9 (5-14)	0.423
Body weight*, kg	24 (15-70)	24 (15-69)	0.397
BMI*, kg/m2	16 (12.8-28.8)	15.8 (12.8 – 23.1)	0.931
Sex, n (%)			
Female (Girls)	20 (51.3%)	16 (42.1%)	0.563
Male (Boys)	19 (48.7%)	22 (57.9%)	
TRD#, degrees, mm	26.88 ± 7.63	28.48 ± 8.51	0.387

#mean ± SD, *median (min-max)
BMI: Body mass index, TRD: Transverse rectal diameter, kg: kilogram.

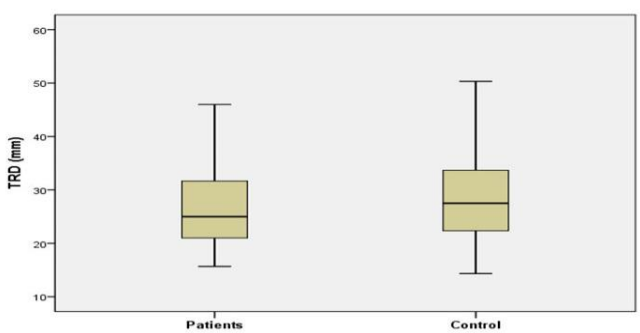
Table 2

Frequencies and characteristics of lower urinary tract symptoms in patients.

	n	%
Voiding Dysfunction	39	
Urgency	27	69.2
Enuresis	20	51.2
Squatting	15	38.4
Urinary incontinance	12	30.7
Staccato urination	11	28.2
>7 Urination in a day	10	25.6
Discontinuous urination	9	23
Painful voiding	8	20.5
Hesitancy	5	12.8

Figure 2

Transverse rectal diameter in patient and control groups



nance (30.7%).

There was no statistically significant difference between the groups in terms of sex, age, body weight and body mass index (BMI). There was no statistically significant difference between the patient group with daytime urinary incontinence and healthy control group in terms of transverse rectal diameter measurements (p=0.387, t=0.870) **(Figure 2)**. Transverse rectal measurements revealed a mean [standart deviation (SD)] TRD of 28.48 ± 7.27 mm in boys and a mean (SD) TRD of 26.75 ± 8.90 mm in girls. An analysis was performed to examine the effect of sex on TRD measurements irrespective of the presence of urinary incontinence, which showed no significant difference between sexes (p=0.351, t=0.938).

The intra-rater agreement for TRD measurements was very strong (p<0.001, r=0.957).

4. Discussion

With this study, we want to determine whether the transverse rectal diameter measured by transabdominal ultrasound has any effect on the physiology of daytime urinary incontinence. We evaluated the TRD of children with day time incontinence with or without FC were compared with healthy controls to evaluate the association between bladder and bowel dysfunction. Dogan et al. suggest to measure rectal diameter by ultrasonograpy to diagnose FC instead of digital examination of rectum. [11] Klijn et al.[10] compared the diameter of the rectum by using ultrasonography in a group having dysfunctional voiding and FC with a control group of without FC. They found the diameter of the rectum was significantly larger than in patient group than the control group. In our study we didn't evaluated FC in groups, but we want to evaluate the effect of transverse rectal diameter on day time urinary incontinence. Patients with voiding disorders and daytime urinary incontinence tend to develop a habit of voiding postponement and contracting the pelvic floor muscles intentionally, which cause a predisposition to urgency, urine leaking and urinary tract infections. Pelvic floor muscle dysfunction is associated with constipation and secondary bladder and bowel dysfunction (BBD). [5,7] While FC and lower urinary symptoms have been studied extensively, the effect of rectal distension on rectal diameter has not been clearly demonstrated.[8] In our study, it was found that transabdominal rectal diameter measurements were not significantly different between the patients with daytime urinary incontinence and healthy controls. In line with our findings, Abreu et al. [7] did not find an association of increased rectal diameter with urgency, daytime urinary frequency, daytime urinary incontinence, nocturia, enuresis and lower urinary tract symptoms, constipation and BBD. This suggests that other factors such as cross-organ interaction between rectum and vesica as well as supraspinal mechanisms may also be involved in voiding dysfunction and daytime urinary incontinence.

In this study, we observed no significant difference when we compared the patients with daytime urinary incontinence with healthy controls in terms of rectal diameter. These findings may indicate that voiding disorders are not affected solely by FC and increased rectal diameter. This may suggests that voiding disorders have a multifactorial etiology which involves central, spinal and sympathetic-parasympathetic neural mechanisms affecting detrusor and sphincter functions, bladder filling and emptying phases and the physiology of urination. Also voiding habits, fluid

intakes and diets have an effect on voiding disorders.
Because of the limited number of studies investigating the association of rectal diameter with urinary incontinence in children, we believe that the data from our study will contribute to the literature.

5. Conclusion

In conclusion, no significant relationship was found between urinary incontinence and rectal diameter in patients with daytime urinary continence in this study. The physiology of urination is complex, involving a multitude of central, spinal and sympathetic-parasympathetic neural mechanisms affecting detrusor and sphincter functions. Therefore, patients should be evaluated in detail for medical history, physical examination and clinical findings. Further evaluation with uroflowmetry and urodynamics should be performed when necessary.

5.1. Limitations

To asses FC for patients and controls with Rome IV criteria and stool diaries are more favorable. Another limitation is small sample size. This is a single centre study. Multicenter, randomized controlled studies in large patient series are necessary to explain the relationship between voiding disorders and rectal diameter as well as FC.

Statement of ethics

This study was approved by the Ethics Committee of the Adıyaman University (Decision no: 2022/7-33, Date: 25.10.2022). The principles of patient privacy and confidentiality were observed, and data were collected in accordance with the Declaration of Helsinki.

Author Contributions

Concept: GI, CO, SY, Design: GI, CO, SY, Literature search: GI, Data Collection and Processing: GI, CO, SY, Analysis or Interpretation: GI, CO, Writing: GI,

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Thymoquinone in a Rat Model of Mesenteric Ischemia-Reperfusion Injury

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Abstract

Aim: The objective of this study was to assess the protective efficacy of thymoquinone at low and high doses against ischemic reperfusion (I/R) injury resulting from superior mesenteric artery occlusion in rats.

Methods: Thirty-five Wistar Albino rats were randomly divided into five groups: control, sham, two thymoquinone treatment groups (50 and 100 mg/kg), and a DMSO control. Intestinal injury was assessed using the Park/Chiu classification system. Blood samples were analyzed for liver enzymes (ALT, AST, ALP), kidney function markers (BUN), and other markers (LDH, phosphorus).

Results: DMSO and low dose thymoquinone groups showed significantly better Park and Chiu scores (p values were 0.015 and p=0.016 respectively) High-dose thymoquinone and DMSO groups had significantly higher ALT levels than the control. Sham, low-dose thymoquinone, and DMSO groups had significantly higher AST levels than the control. Both low-dose and high-dose thymoquinone groups had significantly higher BUN levels than the control.

Conclusion: Our study suggested that low-dose thymoquinone was more effective than high-dose thymoquinone in mitigating I/R-induced intestinal injury. High-dose thymoquinone appeared to have a detrimental effect on intestinal tissue, as evidenced by the lack of significant improvement in histopathological scores compared to the sham group.

***Keywords**: thymoquinone; mesenteric ischemia; reperfusion injury.*

1. Introduction

Mesenteric ischemia occurs when the visceral organs fail to receive an adequate blood supply to meet their normal metabolic demands. This condition is categorized as either acute or chronic, depending on the duration of symptoms. The most common causes of acute mesenteric ischemia (AMI) are emboli to the mesenteric arteries or acute thrombosis associated with pre-existing plaque.[1] Embolism of the superior mesenteric artery (SMA) is the most common cause of AMI.

Delayed diagnosis can lead to bowel necrosis and peritonitis, often requiring extensive intestinal resection. Intestinal tissue is highly susceptible to hypoperfusion. The SMA supplies blood to the small intestine and the proximal two-thirds of the large intestine. [2,3] Ischemic reperfusion injury is a complex pathophysiological process that occurs when blood flow is restored to ischemic tissues.

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Altered mesenteric circulation, often caused by obstruction or diminished blood flow, can lead to decreased oxygen delivery to the visceral organs, insufficient to meet their metabolic needs. [4] The initial vasodilatory response to ischemia can transition to vasoconstriction, which may persist even after blood flow is restored.[5] This early injury, primarily affecting the intestinal mucosa and submucosa, can impair the barrier function, allowing bacterial translocation.[6] Subsequently, systemic inflammatory pathways are activated, leading to worsened vasospasm, further compromising regional blood flow and causing more extensive bowel wall injury. [4,5]

Nigella sativa, or black seed, is a natural source of thymoquinone (TQ), a potent bioactive compound with a wide range of pharmacological activities. TQ has shown promise as an antimicrobial, antioxidant, anti-inflammatory, and antitumor agent, making it a subject of increasing interest in scientific research. [6,7] The antioxidant, anti-inflammatory, and anti-oxidative stress properties of thymoquinone make it a promising candidate for mitigating intestinal I/R injury.

DMSO (Dimethyl Sulfoxide) is a versatile compound with a wide range of applications, including its use as a solvent and a carrier for various medications. It has also been studied for its potential therapeutic effects on various cellular processes. DMSO is also a proper

solvent for thymoquinone. DMSO has been shown to exhibit antioxidant properties, protecting cells from oxidative stress caused by free radicals. This may contribute to its potential anti-inflammatory effects.[8] DMSO has been reported to have anti-inflammatory effects, reducing the production of inflammatory mediators such as cytokines and prostaglandins.1 This may be beneficial in conditions involving inflammation, such as arthritis.[9]

Previous research has shown that thymoquinone exhibits antioxidant and anti-inflammatory properties, which may protect against I/R injury in experimental settings.[10,11] Despite these promising findings, the optimal dose and safety profile of thymoquinone for clinical application have not been well-established. Thus, this study aimed to evaluate the protective effects of low and high doses of thymoquinone on I/R injury in a rat model of SMA occlusion.

2. Materials and Methods

2.1. Animals and Experimental protocol

Thirty-five Wistar albino rats regardless of gender difference, weighing from 200 to 250 g were used in the study. Following an overnight fast (allowing only water to drink), a midline laparotomy incision was used to access the peritoneal cavity under ketamine (Ketalar; Parke-Dawis Eczacibasi, Istanbul, Turkey), (50 mg/kg) and xylazine (Rompun; Bayer AG, Leverkusen, Germany) (10 mg/kg) anesthesia. After abdominal shaving, 10% povidone iodide was used to wipe twice with this solution and the rats were operated with sterile instruments in accordance with the rules of asepsis. Animals were anesthetized and maintained at 37°C during surgery. A midline abdominal incision was made to expose the SMA. After the surgical procedure, 10 mL of saline solution was administered intraperitoneally for hydration.

2.2. Study Group and Surgical Technique

Rats were randomly assigned to five groups of seven animals each. In the control group, the SMA was isolated without ligation. In the I/R groups, the SMA was occluded for 60 minutes using non-traumatic forceps, followed by 120 minutes of reperfusion. Treatment groups received intraperitoneal injections as follows: sham group (saline), low-dose thymoquinone group (50 mg/kg thymoquinone in DMSO), DMSO group (0.2 mL DMSO + 0.8 mL distilled water), and high-dose thymoquinone group (100 mg/kg thymoquinone in DMSO).

Abdominal incisions were closed with 3-0 polypropylene sutures. Animals were euthanized 24 hours after reperfusion under anesthesia. Tissue samples were harvested from the terminal ileum to assess intestinal injury, and blood samples were collected via cardiac puncture.

2.3. Histopathological evaluation

Terminal ileum samples were fixed in 10% formalin, processed for paraffin embedding, and sectioned at a thickness of 5 µm. Hematoxylin and eosin (H&E) staining was performed to visualize tissue morphology. After staining, the sections were dehydrated, cleared, and mounted with entellan. Slides were examined under a light microscope (Olympus BH-2) and photographed using an Olympus DP-70 digital camera.

The severity of intestinal injury was evaluated using the Park/Chiu histological scoring system (13). Scores ranged from 0 (normal mucosa) to 8 (transmural infarction), with increasing scores indicating progressive damage, including subepithelial edema, villous damage, and full-thickness tissue damage.

2.4. Biochemical Analysis

Serum levels of liver enzymes alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), kidney function markers blood urea nitrogen (BUN), and markers of tissue injury lactate dehydrogenase (LDH), and phosphorus were measured using standard biochemical assays.

2.5. Statistical analysis

Data were analyzed using SPSS 15.0 and SigmaStat 3.1. Continuous variables were assessed for normality using the Kolmogorov-Smirnov test (for $n \geq 30$) or the Shapiro-Wilk test (for $n < 30$). Normally distributed data were presented as mean ± standard deviation, while non-normally distributed data were presented as median. One-way ANOVA was used to compare normally distributed data between groups, followed by Bonferroni post-hoc analysis. For non-normally distributed data, the Kruskal-Wallis test was used, followed by pairwise comparisons with the Mann-Whitney U test. The Chi-square test was used to analyze categorical data. Statistical significance was set at $p < 0.05$.

3. Results

DMSO and low dose thymoquinone groups showed significantly better Park and Chiu scores (p values were 0.015 and p=0.016 respectively) when compared with the sham group. The difference was not significant between Sham and high dose thymoquinone groups (p=0.55).

When we compared the DMSO group with the both thymoquinone groups, the difference was not significant (p≥0.05). Also, the difference was not significant between the low dose and high dose thymoquinone groups (p=0.068).

Microscopic examination of the terminal ileum in the control group revealed normal intestinal tissue. Compared to the sham group, both the DMSO and low-dose thymoquinone groups showed significantly lower injury scores ($p = 0.015$ and $p = 0.016$, respectively). However, no significant difference was observed between the sham and high-dose thymoquinone groups ($p = 0.55$). Additionally, no significant differences were found between the DMSO group and either thymoquinone group ($p \geq 0.05$), or between the low-dose and high-dose thymoquinone groups ($p = 0.068$).

ALT: Median (range) ALT levels (U/L) were as follows: control group (59 [40-77]), sham group (120.5 [84-315]), low-dose thymoquinone group (138 [56-260]), DMSO group (244 [122-402]), and high-dose thymoquinone group (254.5 [99-303]). ALT level was significantly higher in high dose thymoquinone and DMSO groups when compared with the control group (*p* values were 0.03 and 0.01 respectively).

AST: Median (range) AST levels (U/L) were as follows: control group (131 [94-243]), sham group (573 [398-910]), low-dose thymoquinone group (494 [326-919]), DMSO group (1066 [503-1527]), and high-dose thymoquinone group (946.5 [495-1464]). The DMSO group had significantly higher AST levels compared to the low-dose thymoquinone group (p =0.026). Additionally, when compared to the control group, the sham, low-dose thymoquinone, and DMSO groups showed significantly elevated AST levels (p values were; p=0.001, p=0.004 and p=0.001). However, no significant difference was found between the low-dose and high-dose thymoquinone groups (p=0.133). Post-hoc analysis indicated a significant difference in AST levels between the sham and DMSO groups (p = 0.048).

BUN: Median (range) BUN levels (mg/dL) were as follows: control group (16.5 [14-18]), sham group (52.4 [19.9-102]), low-dose thymoquinone group (81.3 [16.3-143.7]), DMSO group (43.1 [18.1-106.3]), and high-dose thymoquinone group (95.4 [27.8-126]). Statistical analysis revealed a significant increase in BUN levels in both the low-dose and high-dose thymoquinone groups compared to the control group (p values were 0.023 and 0.003 respectively). However, no significant differences were found between the sham group and the thymoquinone (low and high dose groups) or DMSO groups (p values were; 0.675, 0.196 and 1,

respectively).

ALP & P: Median (range) ALP levels (U/L) were as follows: control group (53 [38-134]), sham group (88.5 [52-115]), low-dose thymoquinone group (98 [37-2769]), DMSO group (15.6 [77-203]), and high-dose thymoquinone group (129 [66-160]). Median (range) P levels (U/L) were as follows: control group (6.1 [5.3-8.5]), sham group (6.2 [5-9.3]), low-dose thymoquinone group (9 [5.8-37.6]), DMSO group (8.4 [5.2-12.6]), and high-dose thymoquinone group (9.8 [4.9-18]). No significant differences were observed in ALP ($p = 0.076$) or p levels ($p = 0.084$) among the groups.

LDH: The DMSO group exhibited significantly higher mean LDH levels (3599 ± 1221 U/L) compared to the control (1179 ± 507 U/L), sham (1604 ± 657 U/L), low-dose thymoquinone (2060 ± 989 U/L), and high-dose thymoquinone (2558 ± 1416 U/L) groups ($p < 0.05$).

4. Discussion

I/R injury is a frequently encountered event in clinical practice. While numerous studies have explored potential agents to mitigate I/R injury, an effective medical solution remains elusive. This study aimed to evaluate the protective effects of thymoquinone on I/R injury in rats and to compare the efficacy of low and high doses.

Our findings suggest that low-dose thymoquinone (50 mg/kg) is more effective in reducing I/R-induced intestinal injury than high-dose thymoquinone (100 mg/kg). While both DMSO and low-dose thymoquinone exhibited protective effects, DMSO was associated with more pronounced adverse effects on laboratory parameters.Our study contributes to the growing body of knowledge on the potential therapeutic benefits of thymoquinone in mitigating I/R injury. Additionally, clinical trials are needed to assess the safety and efficacy of thymoquinone in humans.

Ong et al. demonstrated that nanostructured lipid carrier-loaded thymoquinone exhibited reduced toxicity compared to pure thymoquinone in acute toxicity studies.[12] While both formulations (100 mg/kg) were well-tolerated in terms of mortality, they induced liver toxicity in subacute studies. [12] Similarly, our study revealed elevated liver function tests in rats treated with both 50 mg/kg and 100 mg/kg thymoquinone. However, Ong et al. also reported that both formulations at a lower dose (10 mg/kg) were well-tolerated in mice and did not induce long-term toxicity. [12]

Parlar et al. investigated the prophylactic effects of oral thymoquinone in I/R injury. In contrast, our study focused on the therapeutic effects of intraperitoneal thymoquinone administration. [10] They proposed that premedication with thymoquinone regained the disrupted contractility of the intestinal smooth muscle. In our study we administrated thymoquinone by the intraperitoneal route and this clinically reflects the therapeutic effect other than the prophylactic effect.

Histological analysis revealed normal morphology in the control group in our study. While the sham group exhibited hemorrhage and ulceration in the lamina propria, the low-dose thymoquinone group showed significant improvement in these histopathological changes. Conversely, the high-dose thymoquinone group did not demonstrate any improvement compared to the sham group. Previous studies have suggested the protective mechanisms of thymoquinone against I/R injury.

Tas et al. conducted a study to compare the protective effects of thymoquinone and melatonin against intestinal I/R injury. Their findings revealed that both agents significantly reduced oxidative stress by modulating the activity of antioxidant enzymes such as superoxide dismutase and glutathione peroxidase, as well as decreasing the levels of lipid peroxidation marker malondialdehyde. [13] Additionally, treatment with thymoquinone and melatonin significantly decreased the number of apoptotic cells in the intestinal tissue. Aydin et al. investigated the antioxidant effects of intraperitoneal thymoquinone on intestinal I/R injury and found that it significantly reduced histopathological damage in the heart, lung, and kidney tissues, as assessed by light microscopy. [11]

Our study demonstrated that DMSO exhibited a protective effect on intestinal tissue, as evidenced by the regression of histopathological findings compared to the sham group. Low-dose thymoquinone also showed some protective effects, but the difference compared to DMSO was not statistically significant. These results suggest that the protective effects observed with low-dose thymoquinone may be partially attributed to the DMSO solvent.

In the literature, DMSO has been shown to protect tissues or even an entire organ, from ischemic damage. [14-16] DMSO captures free radicals. Wood et al. reported many known pharmacological properties of DMSO including cryoprotective and radioprotective effects, effect on serum cholesterol in experimental hypercholesteremia, and platelet aggregation antagonism[17].

Previous research has demonstrated DMSO's potential to protect tissues from ischemic damage. [14-16] Also, DMSO is known to scavenge free radicals and exhibit various pharmacological properties, including cryoprotective, radioprotective, and anti-platelet effects. [15]

DMSO is known to enhance the cellular permeability of various substances, including drugs. When mixed with DMSO, the physiological effects of the many drugs increase. The most important benefit of this effect is the potential for lower dosages requirement, which could reduce side effects and toxicity.

Intestinal I/R injury can lead to bacterial translocation and endotoxemia, resulting in damage to distant organs such as the liver and kidneys. [17-20] To assess potential systemic effects of I/R injury, we also evaluated liver and kidney function tests in our study.

Overall, neither thymoquinone nor DMSO improved laboratory parameters. However, DMSO alone appeared to exacerbate kidney function, as indicated by elevated BUN levels. High-dose thymoquinone also seemed to have a detrimental effect on kidney function. Both high-dose thymoquinone and DMSO led to increased liver enzyme levels (ALT and AST) compared to the control group, with DMSO causing a more pronounced effect on ALT levels.

4.1. Study Limitations

The number of the study population in each group was limited.

5. Conclusion

Our study suggested that low-dose thymoquinone (50 mg/kg) was more effective than high-dose thymoquinone (100 mg/kg) in mitigating I/R-induced intestinal injury. High-dose thymoquinone appeared to have a detrimental effect on intestinal tissue, as evidenced by the lack of significant improvement in histopathological scores compared to the sham group. While both DMSO and low-dose thymoquinone exhibited protective effects, DMSO was associated with more pronounced adverse effects on laboratory parameters.

Statement of ethics

This study was approved by the Ethics Committee of the Eskişehir Osmangazi University(HADYEK) (Decision no: 2015-90-480,).

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Neuropathic Pain in Lumbar Disc Herniation: A Comparative Study of Surgical Outcomes

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Abstract

Aim: This study aimed to assess the prevalence of neuropathic pain in patients diagnosed with lumbar disc herniation and to examine the correlation between neuropathic pain and surgical intervention.

Methods: We performed a retrospective cohort study involving 217 patients diagnosed with lumbar disc herniation who reported persistent low back pain from January to December 2023. We assessed the existence of neuropathic pain using the Douleur Neuropathique 4 (DN4) questionnaire. We evaluated pain severity using the Visual Analogue Scale (VAS). We categorized the patients into three groups: non-operated, operated without stabilization, and operated with stabilization.

Results: The patients had a mean age of 45.09 ± 14.28 years, with 57.6% being male. A DN4 score of > 4 indicated that neuropathic pain was present in more than half (51.2%) of the patients. The prevalence of neuropathic pain was 32.8% in the non-operated cohort, 67.3% in the operated cohort without stabilization, and 85% in the operated cohort with stabilization. Age exhibited a positive link with neuropathic pain score ($r = 0.16$, $p<0.05$), whereas no significant association was identified between sex and body mass index (BMI).

Conclusion: Individuals with lumbar disc herniation frequently experience neuropathic pain. Surgical intervention, particularly stabilization surgery, is a significant risk factor for the onset of neuropathic pain. Consequently, it is advisable to assess the risk of neuropathic pain and implement appropriate interventions for patients planned for surgical intervention. Age plays a significant role in the development of neuropathic pain, indicating that older patients require closer monitoring.

***Keywords**: Chronic low back pain, lumbar disc herniation, neuropathic pain*

1. Introduction

Lumbar disc herniation is a condition in which an intervertebral disc in the lower spine shifts or ruptures, resulting in protrusion. This typically compresses the spinal nerve roots, resulting in symptoms such as low back pain, leg pain, and neurological deficits[1]. However, some patients may also experience neuropathic pain, a type of pain resulting from nerve damage or dysfunction, which can significantly affect their quality of life[2]. Neuropathic pain is a notably difficult illness because of its propensity to become chronic and its potential resistance to existing therapies.

Studies on pain associated with lumbar disc herniation have generally focused on mechanical pain. However, there has been limited research on neuropathic pain, and its prevalence, risk factors, and effects on the clinical management of patients are not fully understood[3,4].

In particular, there is a lack of data related to assessing the risks of developing neuropathic pain in the operated patients and the demographic or clinical variables associated with such risks. As a result, clinicians do not have sufficient knowledge to predict and manage the risks associated with neuropathic pain in patients with lumbar disc herniation.

This study presents significant factors regarding the prediction and management of neuropathic pain risks, particularly in patients scheduled for surgical intervention.

2. Materials and Methods

This retrospective data study included patients aged 18 to 65 years who reported to our outpatient clinic with low back pain between January and December 2023 and had a history of chronic low back pain for a minimum of 3 months. The study's further inclusion criteria were a positive straight leg raise test, a positive Schober test, and a diagnosis of lumbar disc herniation confirmed by lumbar magnetic resonance imaging (MRI) data. The exclusion criteria included the presence of additional MRI findings; clinical indicators of significant pathology during physical examination (red flags); abnormal

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laboratory test results (blood glucose, alanine transaminase [ALT], aspartate transaminase [AST], urea, creatinine, complete blood count, sedimentation rate, C-reactive protein, and urinalysis); a history of stroke, spinal surgery, diabetes, malignancy, chronic inflammatory low back pain, and ongoing use of analgesics and/or antidepressants within the past six months. We evaluated pain intensity using the Visual Analogue Scale (VAS)[5]. The VAS is a scale ranging from 0 to 10, where 0 indicates the absence of pain and 10 signifies the most intense pain. The patients were instructed to indicate the position on the scale that reflected their pain level. We conducted the assessment of neuropathic pain using the Douleur Neuropathique 4 (DN4) questionnaire[6]. The DN4 is a 10-item questionnaire that consists of 7 items that assess pain features and perceptions, and 3 items that pertain to examination. Each item receives a score of 1 for a "yes" response and 0 for a "no" response. A cumulative score of 4 or above signifies the presence of neuropathic pain in the patient. Tests were performed on operated patients at least 2 months after surgery.This study also assessed demographic and clinical data, including age, sex, body mass index (BMI), and surgical status.

2.1. Statistical Analysis

The data was analyzed statistically using SPSS 25.0 software (IBM Corp., Armonk, NY, USA). The normality of the data distribution for continuous variables was assessed using the Shapiro-Wilk test. Data that followed a normal distribution were expressed as mean ± standard deviation, whereas data lacking a normal distribution were expressed as median (minimum-maximum). One-way analysis of variance (ANOVA) was employed for normally distributed data, while the Kruskal-Wallis test was utilized for non-normally distributed data to evaluate the differences between the groups. The chi-square test was utilized to compare categorical data. The Pearson correlation analysis was conducted to assess the linear correlations among the variables. Furthermore, multivariate linear regression analysis was conducted to assess the impact of factors like age, sex, BMI, and surgical intervention on neuropathic pain. The neuropathic pain score (DN4) served as the dependent variable in the regression model. The significance threshold was established at $p<0.05$ for all statistical analyses.

3. Results

This research comprised a total of 217 patients. Of these patients, 125 (57.6%) were male and 92 (42.4%) were female. The average age of the patients was calculated to be 45.09±14.28 years. The proportion of patients having a DN4 score of 4 or above in the general population was established at 51.2%. The patients were categorized into three groups according to their surgical intervention history: non-operated, operated without stabilization, and operated with stabilization. The incidence of neuropathic pain in these groups was shown to be 32.8%, 67.3%, and 85%, respectively (Table 1). A significant connection was shown between age and DN4 score ($r = 0.16$). The regression analysis indicates that age significantly affects the DN4 score ($p<0.05$), revealing a small rise in the neuropathic pain score with advancing age. No statistically significant correlation was seen between sex and DN4 score ($p = 0.75$). The correlation between BMI and the DN4 score was not statistically significant ($p = 0.95$) (Table 2). A statistically significant, moderately positive connection between DN4 and VAS ratings was identified ($r = 0.318$, $p < 0.001$) (Graphic 1).

Figure 1

The regression plot shows the relationship between the Visual Analogue Scale (VAS) and DN4 scores, which measure the intensity of pain and the presence of neuropathic pain, respectively.

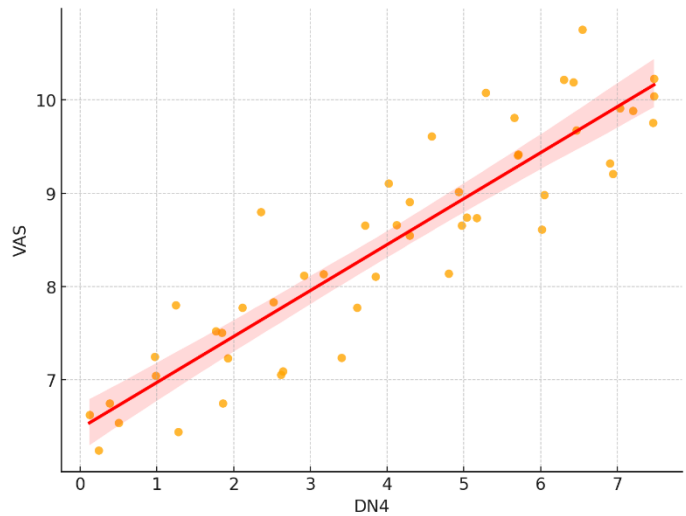

Table 1

Distribution of Patients Based on DN4 Scores and Surgical Intervention Status

	DN4<4	DN4 ≥ 4	Total
Non-Operated	82	40	122
Operated Without Stabilization	18	37	55
Operated With Stabilization	6	34	40
Grand Total	106	111	217

Table 2

Demographic and Clinical Characteristics Based on DN4 Scores

	DN4<4	DN4 ≥4	p
Age (Mean ± SD)	42.7 ± 15.1	48.5 ± 13.2	0.03
Sex			
·Male	%57	%42	0.75
·Female	%43	%58	
BMI (Mean ± SD)	28.2 ± 4.8	27.9 ± 4.5	0.7

4. Discussion

This study's findings indicate that neuropathic pain is prevalent among individuals with lumbar disc herniation and that surgical intervention significantly influences the progression of neuropathic pain. The prevalence of neuropathic pain was particularly elevated in individuals who underwent stabilization surgery.

Epidemiological studies indicate that the incidence of neuropathic pain among patients with low back pain is 19.3% and

65.3%[7,8]. This heterogeneity may be influenced by the length of low back pain (acute, subacute, chronic), the demographic characteristics of the study group (ethnicity, rural, or urban inhabitants), the screening test employed, and the kind of institution where the study was done (primary, secondary, or tertiary). Chronic lumbar disc herniation is identified as the most prevalent neuropathic pain condition[9]. Freynhagen et al. highlighted that 37% of 7,772 patients with persistent low back pain experienced neuropathic pain[10]. Kaki et al. conducted multicenter research involving 1,169 patients across 117 locations, indicating that 54.7% of individuals with chronic low back pain (CLBP) experienced neuropathic pain[11]. The literature suggests that age and sex significantly influence the presence of neuropathic pain. Sakai et al. reported in their series that the frequency of neuropathic pain decreased with age[12], whereas Shiri et al.'s 11-year longitudinal study, which included 3.505 patients, reported an increase in neuropathic pain frequency with age[13]. In a 300-patient cohort of Siddiqui et al., 61.7% of the patients were female [14], while in a small observational study by Ulutaş et al., the male sex was predominant (60%) [15]. We observed neuropathic pain in 51.2% of the patients in our study. The incidence of neuropathic pain increased with age, and male sex was predominant (57.6%). The variations observed in the literature may stem from the demographic characteristics of the patient populations, as well as environmental and genetic factors or the methodological approaches employed in the studies. In particular, factors such as hormone differences, genetic predispositions, and biological variations in the nervous system may have affected our results.

A study involving 300 patients with lumbar disc herniation reported a statistically significant relationship between pain score and BMI (p = 0.0005) [14]. The writers said that being overweight makes you more likely to have chronic systemic inflammation. This is because being overweight raises the production of cytokines and the activation of proinflammatory substances, such as TNF-α, IL-6, and blood IL-6 levels. In a separate study, the authors indicated a noteworthy correlation between BMI and DN4 score (p = 0.034) [16]. In a study with 141 patients, Karacif and Bölükbaşı found that there was no significant link between sex and BMI in relation to the development of neuropathic pain compared to the non-neuropathic group [17]. Our study found no significant relationship between neuropathic pain and sex or BMI (p = 0.7 and p = 0.9, respectively). Dolgun et al. conducted a prospective observational study that identified neuropathic pain in 54 out of 710 patients following lumbar disc herniation surgery. The authors proposed that nerve injury from disc herniation and/or lumbar discectomy could compromise normal nerve conduction. They indicated that receptors for inflammatory cytokines, including TNF-alpha, IL-1, and IL-6, may accumulate in the affected sensory neurons, potentially altering their functions. Furthermore, this accumulation may elevate the levels of allodynia-related cytokines, which could be linked to nerve transection, glutamate release, and the activation of N-methyl-D-aspartate (NMDA) receptors [18]. Our study revealed that the incidence of neuropathic pain was notably greater in patients who underwent surgical procedures in comparison to those who received conservative treatment.

This study has specific limitations. The study's retrospective design necessitated the collection of data from patient records, which may introduce specific limitations regarding data quality and integrity. Furthermore, our study was conducted at a single center and did not incorporate data from diverse geographic regions and various patient populations, which may restrict the generalizability of the findings. Self-report scales DN4 and VAS were used to assess the neuropathic pain and pain intensity. Since these self-report scales involve subjective responses, there is a risk of bias in the patient responses. The sex distribution is not balanced in our study; male patients outnumbering females (57.6%), which may hinder a sound assessment of the effect of sex on neuropathic pain. Furthermore, our study lacks sufficient data on the long-term outcomes of neuropathic pain after surgical intervention, which limits our ability to evaluate the long-term effects of neuropathic pain progression during the postoperative phase. Finally, other potential factors that may influence the development of neuropathic pain (e.g., psychosocial status, genetic factors, and environmental factors) were not taken into consideration in our study. The limitations outlined must be taken into account when interpreting the findings of our study. Future research should strive to address these limitations and concentrate on achieving more comprehensive results.

5. Conclusion

This study demonstrated that neuropathic pain is a common complication in patients diagnosed with lumbar disc herniation, and that this risk is higher among patients who undergo surgical treatment. The study determined that patients who underwent stabilization surgery had a higher prevalence of neuropathic pain. This finding highlights the importance of considering the risk of developing neuropathic pain when scheduling surgical treatment. The study also shows that age is an important factor in the development of neuropathic pain. The risk of neuropathic pain increases with age, indicating a need for closer postoperative follow-up monitoring for older patients. In conclusion, the early diagnosis of neuropathic pain in the patients with lumbar disc herniation and the development of personalized treatment strategies for these patients may increase treatment success. We should accept a detailed assessment of the risk of neuropathic pain in patients undergoing surgical treatment as a crucial step in patient management. To the best of our knowledge, this study is the first to investigate the prevalence of neuropathic pain in patients diagnosed with lumbar disc herniation based on the history and type of surgical treatment, thereby making a significant contribution to the literature.

Statement of ethics

This study was approved by the Ethics Committee of the Adana City T&E Hostital (2024/5-160). The principles of patient privacy and confidentiality were observed, and data were collected in accordance with the Declaration of Helsinki.

Author Contributions

Concept: ZSŞ/AY, Design: ZSŞ/AY, Literature search: GI, Data Collection and Processing: ZSŞ/AY, Analysis or Interpretation: ZSŞ/AY, Writing: ZSŞ/AY,

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Total Lower Eyelid Reconstruction Due to Clear Cell Hidroadenocarcinoma

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Abstract

Aim: To discuss the surgical management of near-total defects due to clear cell hidroadenocarcinoma, a rare tumor of the lower eyelid, and to contribute to the limited literature on reconstruction options in this area.

Methods: A 93-year-old female patient presented with a rapidly growing lesion on her left lower eyelid. Histopathological examination confirmed a diagnosis of malignant clear cell hidroadenocarcinoma. The tumor was excised with wide total excision under general anesthesia. The resultant defect was reconstructed using a full-thickness mucosal graft from the soft palate and a Mustarde cheek advancement flap. Postoperative medial canthus revision was performed with a local flap.

Results: Postoperative follow-ups revealed complete eyelid closure and sufficient tear drainage. Functional and aesthetic outcomes were satisfactory. Due to the patient's advanced age and general condition, no radiotherapy or chemotherapy was applied, and a follow-up process was recommended.

Conclusion: Clear cell hidroadenocarcinoma is a rare and aggressive malignant tumor. Mustarde cheek advancement flap is a suitable option for repairing extensive defects in the lower eyelid, especially in elderly patients, as it provides adequate tissue support. Detailed reporting of such cases contributes to the literature and aids in the management of this rare tumor.

***Keywords**: Clear cell hidroadenocarcinoma, lower eyelid reconstruction, Mustarde flap*

1. Introduction

Due to the anatomy and functions of the lower eyelid, reconstruction options are quite limited. The goals in total full-thickness lower eyelid defect repair include maintaining the continuity of the lateral and medial canthi, tarsus, and posterior lamella, providing a drainage canal for tears, and repairing the dermis and hypodermis. Postoperatively, functional repair can be deemed successful if the upper and lower eyelids completely close when the eye is shut, and tear drainage to the inferior fornix is maintained.

Full-thickness losses exceeding 75% of the lower eyelid are rare. In elderly patients, nearly total lower eyelid defects are mostly caused by malignancies[1]. Among malignant causes, basal cell carcinoma is the most common[2]. As a low-grade tumor, basal cell carcinoma rarely shows extensive infiltration or nodular metastatic involvement. Clinicians should consider rare tumors like hidroadenocarcinoma and eccrine porocarcinoma in the differential diagnosis when encountering rapidly growing, malignant masses in the lower eyelid.

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2. Case

A 93-year-old female presented to our center with complaints of a growing mass on her left lower eyelid. The patient reported that the lesion had developed over two years but had begun to grow rapidly in the last four months. She led a Mediterranean lifestyle as a farmer and had been exposed to sunlight extensively since childhood.

At the initial examination, the tumor measured 12 mm in diameter (Figure 1). By the time of surgery, the tumor had grown to 35 mm in diameter (Figure 2), with 15 days elapsed between the initial examination and the surgery. Macroscopically, the mass appeared raised, erythematous, with a central ulcer and crusted surface. The lesion had shown a slow growth pattern for the first two years but began to grow rapidly in the last four months, with associated pain reported in the last month.

MRI with contrast revealed full-thickness infiltration of the left lower eyelid, while the globe remained intact. Bilateral lymphatic involvement was observed in the cervical chain. No evidence of pulmonary metastasis was noted on direct radiographic imaging. The patient was discussed at a preoperative multidisciplinary oncology board meeting. A total wide excision of the mass was planned with subsequent treatment based on the pathological diagnosis.

2.1. Surgical Technique

Under general anesthesia, the patient underwent a wide total excision of the mass, followed by near-total lower eyelid recon-

struction (Figure 3). Continuity of the conjunctiva was achieved using a full-thickness mucosal graft harvested from the soft palate (Figure 4). Conjunctival sutures were placed using 5.0 vicryl rapid in a continuous manner. The donor site was covered with Surgicel and closed with absorbable sutures. A simultaneous dacryocystorhinostomy was planned but could not be performed as the distal duct could not be explored following tumor excision. The entire defect was repaired using a cheek advancement flap. Medial canthopexy was achieved by securing the conjunctival graft to the periosteum at the medial canthus. Postoperatively, the patient was prescribed oral antibiotics and analgesics for one week. The eye was covered with a sterile dressing, which was changed daily. Sutures were removed on postoperative day 10. Medial canthus revision was planned due to a 5 mm x 1 cm distal flap necrosis. Reconstruction was completed using a local flap rotated from the nasal dorsum (Figure 5). Postoperative care included upward massage of the cheek and lifelong artificial tear use 3–4 times daily. Follow-up visits every six months were recommended. Subsequent evaluations revealed no eyelid gap in the closed state, and functional restoration was achieved.

Figure 1 Initial appearance of the tumor during the first clinical examination.

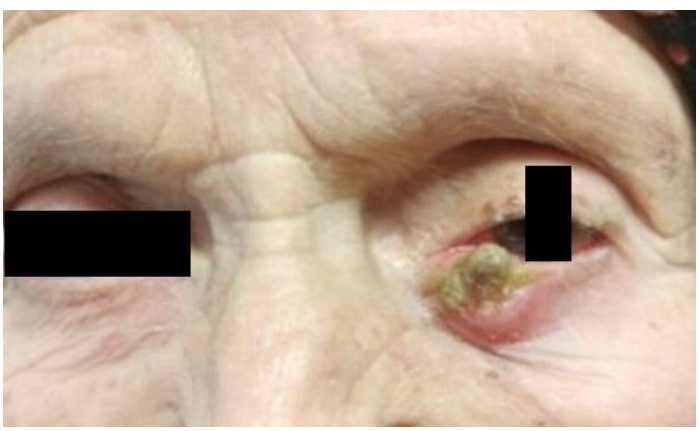


Figure 2 Rapid growth of the tumor within 15 days before surgery

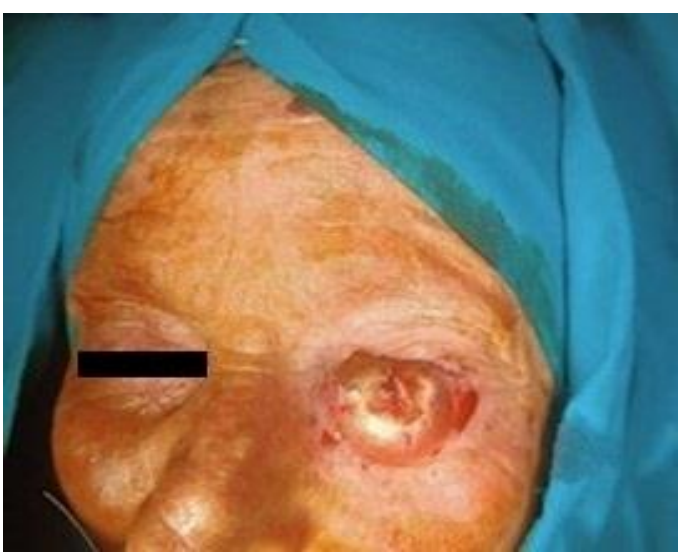


Figure 3 Intraoperative image showing the reconstructed defect after the Mustarde cheek advancement flap was applied

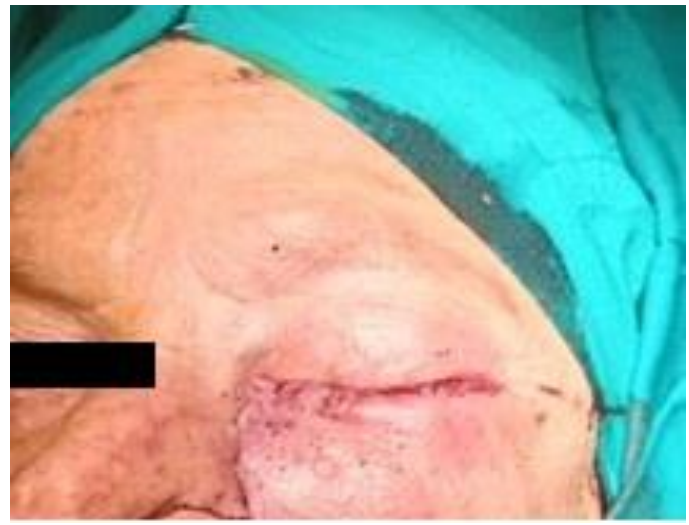


Figure 4 Soft palate mucosal graft used to reconstruct the posterior lamella of the lower eyelid

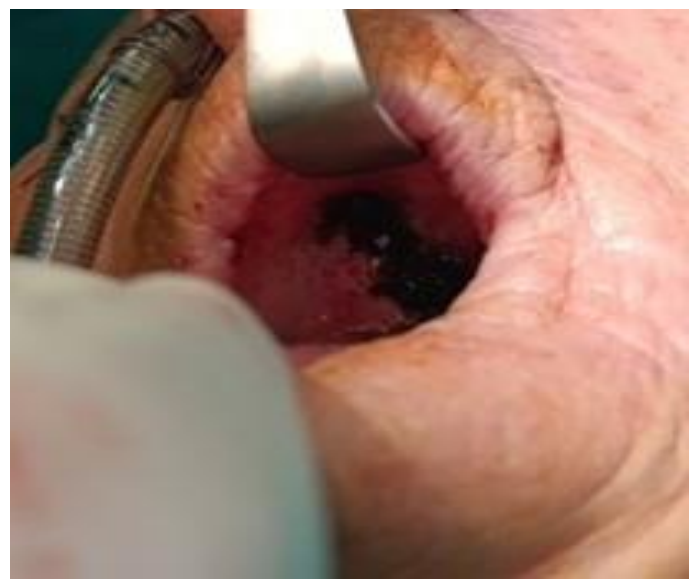
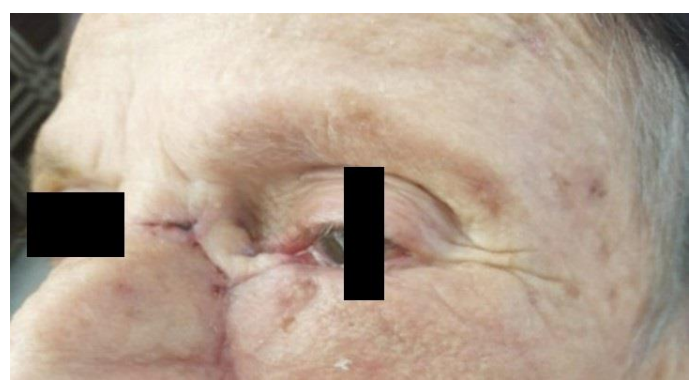


Figure 5 Post-revision image after medial canthus repair using a local flap rotated from the nasal dorsum



2.2. Histopathological Examination

Histopathological evaluation confirmed malignancy. Immunohistochemical staining results included CK7(+), CD10(+), P53(+), CK20(-), EMA (focal positive), PANCK (+), BEREP4(-), ANDROGEN (artefactual), S-100(-), PAX8(-), and Ki-67 (60–70%). Based on histomorphological and immunohistochemical findings, the diagnosis remained inconclusive between clear cell hidroadenocarcinoma and eccrine porocarcinoma. Multidisciplinary oncology board evaluation was recommended. The surgical margins were clear with 4 mm of healthy tissue laterally, medially, and inferiorly.

2.3. Treatment

Due to the patient's advanced age, chronic sun exposure, and the tumor's locally aggressive and metastatic nature, a diagnosis of clear cell hidroadenocarcinoma was favored. Radical neck dissection, low-dose chemotherapy, and localized radiotherapy were deemed unsuitable given the patient's age and general condition. The patient was placed under surveillance for follow-up.

3. Discussion

Numerous techniques have been described for repairing lower eyelid defects exceeding 75%. Bilateral pedicle flap transfers from the upper eyelid are suitable for elderly patients but are impractical for large tissue defects[3]. Cheek advancement flaps are highly effective for extensive defects[4,5]. For defects near the medial canthus, a composite island flap with a reverse-flow angular artery pedicle from the lateral nasal dorsum offers a three-layered (mucosa, cartilage, skin) repair[6]. However, this technique has limitations, such as flap thickness and donor site constraints. The auriculotemporal artery perforator temporal fascia island flap should be considered for large defect repairs[7].

In this case, the defect measured approximately 45 mm x 45 mm. The patient's elderly and frail condition provided a large, sagging soft tissue reservoir in the malar region. Due to the defect size, a Mustarde cheek advancement flap was deemed the most appropriate reconstruction option.

For conjunctival repair of the lower eyelid, the soft palate mucosa is an excellent option due to its sufficient size for grafting8. Posterior lamella reconstruction using buccal mucosa grafts has been associated with high graft loss rates9. Auricular cartilage, tendon, and even temporal fascia are ideal donors for tarsus reconstruction[10,11,12].

However, successful three-layered reconstruction requires the continuity of the orbicularis muscle. Without muscle integrity, posterior lamellar grafts are at risk of ischemia and subsequent loss.

4. Conclusions

Hidroadenocarcinoma is a rare, locally aggressive tumor. Detailed reporting of rare cases is essential for building a network of knowledge regarding the disease's course and treatment. Due to the anatomy of the lower eyelid, achieving total functional reconstruction in this region is challenging. For total and full-thickness lower eyelid defects, the Mustarde cheek advancement flap offers an excellent tissue support option, particularly in elderly patients.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given her consent for his/her/their images and other clinical information to be reported in the journal. The patient understand that her name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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The Relationship between Preoperative Pain Beliefs and Postoperative Pain Levels in Surgery Patients

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Abstract

Aim: This study was conducted to determine the relationship between preoperative pain beliefs and postoperative pain levels in patients undergoing elective surgery.

Methods: This descriptive and cross-sectional study was conducted at Cukurova University Balcalı Hospital between July and September 2024 with 115 patients who met the inclusion criteria. The data of the study were collected using the Personal Information Form, Visual Assessment Scale (VAS) and Pain Beliefs Scale (PAS). Independent samples t-test was used for normally distributed data, Kruskal Wallis and Mann Whitney-U tests were used for non-normally distributed data, and Pearson correlation coefficient was calculated to determine the relationship between pain beliefs and the pain they experienced.

Results: The average score of the patients in the organic beliefs sub-dimension of the scale was 2.43±0.60, and the average score in the psychological beliefs sub-dimension was 2.39±0.63. It was determined that the average score of the patients in the organic beliefs sub-dimension was affected by surgical experience, and the average score in the psychological beliefs sub-dimension was affected by the ASA scores. It was determined that there was a positive relationship between organic beliefs and psychological beliefs, and a negative relationship between psychological beliefs and postoperative pain severity.

Conclusion: It can be said that patients believe that pain is both psychological and organic, and that as the severity of pain decreases, their belief that pain is psychological increases. Preoperative assessment of patients' pain beliefs and implementation of individualised education and support programmes to strengthen psychological beliefs may play an important role in reducing postoperative pain severity.

***Keywords**: Surgery, pain, pain beliefs, nurse*

1. Introduction

Pain is defined by the International Organization for the Study of Pain as "an unpleasant sensory and emotional experience that can be defined by existing or potential tissue damage"[1,2]. Postoperative pain is defined as a stressful experience, as well as physical pain, for patients that begins after surgical trauma and is related to the incision location, width and type. Postoperative pain, which is acute and multidimensional, is a very challenging situation in postoperative patient management. Despite increasing efforts and policies to improve pain management in surgical patients, more than 80% of patients undergoing surgical procedures have been found to experience postoperative pain. It is reported that almost 75% of these patients experience moderate to severe postoperative pain[3-6].

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For this reason, in addition to evaluating and managing patients' pain, cultural and religious differences should also be taken into account. Nurses should be able to recognize and evaluate pain in order to reduce post-surgical pain and improve outcomes[7].

Pain beliefs, which play an important role in perceived pain, appear as a situation related to how the person makes sense and interprets the common views, attitudes, judgments and events in the society in which he lives. Patients with negative pain beliefs experience more pain in the postoperative period and find pain management interventions less effective[8]. Pain beliefs; It can be defined as cognitions or thoughts about the cause of pain, its meaning, or appropriate treatments for pain. Such beliefs may be personally or culturally adopted[9]. Pain beliefs, an important concept in pain management, reveal how patients perceive pain. These beliefs are divided into two: psychological and organic. While organic beliefs show that pain is caused by tissue damage, trauma or other physical factors, psychological beliefs reveal that pain is related to psychological factors such as depression and anxiety. What patients believe and do about their pain generally affects their actual experiences, functionality, ability to cope with pain, attitudes towards pain, and treatment processes[10-12]. Developing treatment strategies to improve pain beliefs in the preoperative period is very important in order to effectively manage pain in the postoperative period. In this context, sur-

gical nurses who comprehensively assess pain and explore pain beliefs are likely to provide quality pain management and treatment, contributing to the end of preventable pain [8-13].

It is thought that correcting patients' false beliefs about pain will contribute positively to effective pain management. This study was conducted to evaluate the relationship between preoperative pain beliefs and postoperative pain severity in surgical patients.

2. Materials And Methods

This research was conducted in a descriptive and cross-sectional manner with the aim of determining the relationship between preoperative pain beliefs and postoperative pain levels in surgical patients.

The population of the research is Çukurova University It consists of patients who apply to Balcalı Hospital Health Application and Research Center to undergo surgery in the urology clinic. The sample of the study was calculated with G*Power 3.1.9.7 according to the reference source.[10] According to the power analysis correlation, the medium effect size (d = 0.3) was calculated with a margin of error of 0.05 and a power of 0.90 and was determined as 112. The sample of the study consisted of 115 patients who volunteered to participate in the research and met the inclusion criteria within the relevant date range in which the research was planned to be conducted.

Criteria for inclusion in the research:

- ✓ Being literate,
- ✓ Being 18 years or older,
- ✓ Being conscious,
- ✓ Ability to understand and speak Turkish and not have hearing or visual impairment,
- ✓ Having undergone elective surgery
- ✓ Agreeing to participate in the research.

Data were collected using the 'Personal Information Form' created by the researcher by scanning the literature, the 'Visual Assessment Scale' (VAS) and The Pain Beliefs Questionnaire (PBQ) to evaluate pain.

The 'Personal Information Form' created by the researcher in line with the literature includes 11 questions regarding the patients' socio-demographic, disease-related and pain-related characteristics (age, gender, marital status, educational status, employment status, chronic disease, surgical experience, pain levels, etc.). contains[1,14].

Visual Analog Scale (VAS)

Visual Analog Scale (VAS), used to measure pain, consists of a scale that is evaluated by making markings on a 100 mm or 10 cm vertical or horizontal line, at one end of which there is no pain, and at the other end, where there is the most severe pain. When using the VAS developed by Price et al. (1983), patients are informed that they should mark any area according to the presence and severity of pain among the determined points[15]. 1-4, 5-6 and 7-10 indicate mild, moderate and severe pain. VAS scores immediately after the surgery were not evaluated because some of the patients were still under anesthesia and some received analgesia before leaving the surgery. VAS evaluation was performed at the 8th, 16th and 24th hours.

The Pain Beliefs Questionnaire (PBQ)

The Pain Beliefs Questionnaire (PBQ) was developed by Edwards et al. in 1992 to evaluate beliefs about the cause and treatment of pain. In our country, the validity and reliability of the scale was determined by Berk in 2006 and adapted to Turkish. The Pain Beliefs Questionnaire measures the source and consequences of pain in two different ways: psychological and organic. These are organic beliefs consisting of 8 items and psychological beliefs consisting of 4 items.

- Organic Beliefs: Articles 1, 2, 3, 5, 7, 8, 10, 11,
- Psychological Beliefs: Includes items 4, 6, 9, 12[16-18].

Patients are asked to mark the item that best suits them out of 6 options ranging from 1st "never" to 6th "always". Scores vary between 1 and 6 for each item.

In the reliability study conducted by Edwards et al., the Cronbach Alpha coefficient was found to be 0.71 for the organic beliefs subtest and 0.73 for the psychological beliefs subtest[1,5,19]. In our research, the Cronbach Alpha coefficient was found to be 0.69 for the organic beliefs subtest and 0.62 for the psychological beliefs subtest. Research data was collected through face-to-face interviews between July and October 2023. Between the data collection dates, patients who would undergo surgery who met the sampling inclusion criteria were met and informed about the purpose of the study. Before collecting data, patients were informed by the researcher about the purpose and method of the research. It was explained to the patients that the information obtained within the scope of the research would be kept confidential and would be used only for scientific study purposes. Verbal consent was obtained from the patients before the research. Then, the Personal Information Form, Visual Analog Scale and The Pain Beliefs Questionnaire were filled in when the patients felt comfortable, in a way that would not affect the treatment and care processes. Data collection took approximately 10 minutes. The patients were then thanked for participating in the study.

Table 1

Distribution of patients' demographic characteristics

	X ± SD	Min-Max
Age	53.37±15.08	18-75
Pain level	3.27±2.04	0-10
	n	%
Gender		
·*Woman*	53	46.1
·*Male*	62	53.9
Marital status		
·*Married*	93	80.9
·*Single*	22	19.1
Education level		
·*Primary education*	62	53.9
·*Secondary education*	32	27.8
·*University*	21	18.3
ASA score		
·*ASA I*	66	57.4
·*ASA II*	49	42.6
Anesthesia Type		
·*General anesthesia*	91	79.1
·*Local anesthesia*	24	20.9
Surgical Experience		
·*Yes*	84	73.0
·*No*	31	27.0
More pain than expected		
·*Yes*	48	41.7
·*No*	67	58.3

*n:number, %:percentage, X:mean, SD:Standard deviation, Min:Minimum value, Max:Maximum value

Table 2

Scale sub-dimension and total score averages of the patients

	X ± SD	Min-Max	Scale Min-Max
Organic Beliefs	2.43±0.60	1-4.1	1-6
Psychological Beliefs	2.39±0.63	1-4	1-6

*n:number, %:percentage, X:mean, SD:Standard deviation, Min:Minimum value, Max:Maximum value

Table 3

Comparison of patients' sociodemographic data and scale subscale score averages

	Organic Beliefs $\bar{X} \pm SD$	Psychological Beliefs $\bar{X} \pm SD$
Gender		
Woman	2.41±0.52	2.36±0.60
·Male	2.45±0.67	2.41±0.66
Test	t=0.367	t=0.428
	p=0.714	*p=0.669*
Marital status		
·Married	2.43±0.59	2.41±0.64
·Single	2.42±0.64	2.30±0.63
Test	MW-U=1019.000	MW-U=920.000
	p=0.997	*p=0.457*
Education level		
·Primary education	2.41±0.55	2.46±0.51
·Secondary education	2.30±0.47	2.32±0.67
·University	2.67±0.85	2.30±0.87
Test	KW=4.395	KW=0.444
	p=0.111	p=0.801
ASA score		
·ASA I	2.41±0.66	2.29±0.69
·ASA II	2.46±0.51	2.53±0.54
Test	t=-0.426	t=-2.127
	p=0.671	*p=0.036*
Anesthesia Type		
·General anesthesia	2.44±0.56	2.42±0.62
·Local anesthesia	2.38±0.74	2.28±0.68
Test	t=0.448	t=0.986
	p=0.665	p=0.327
Surgical Experience		
Yes	2.51±0.61	2.43±0.63
No	2.21±0.52	2.29±0.64
Test	t=2.386	t=1.074
	p=0.019	p=0.285
More pain than expected		
Yes	2.39±0.39	2.45±0.60
No	2.46±0.72	2.35±0.66
Test	t=-0.681	t=0.889
	p=0.497	p=0.376

*X: mean, SD: Test statistic value using standard deviation, t: t test in independent groups, KW: Kruskal Wallis analysis, MW-U: Mann Whitney-U test

Statistical analysis of the data obtained was made using the SPSS 22 (Statistical Package of Social Science) package program. Descriptive statistics were used during the evaluation of the data. Independent samples t-test was used for normally distributed data, Kruskal Wallis and Mann Whitney-U tests were used for non-normally distributed data, and Pearson Correlation coefficient was calculated to determine the relationship between pain beliefs and the severity of pain experienced. The results were evaluated at the α=0.05 significance level.

In order to conduct the research; Approval from the ethics committee of a university (Decision no: 135/40 Date: 14.07.2023) and necessary institutional permissions were obtained from the hospital where the research was conducted. Within the scope of the research, patients were given information about the research, the purpose of the research was explained, and verbal consent was obtained from the patients indicating that they agreed to participate in the research. Patients were informed that their choice to participate in the study and the research results would not affect their treatment/care. The research was conducted in accordance with the Declaration of Helsinki.

3. Results

The average age of the patients was 53.37±15.08%, 53.9% were male, 80.9% were married, 53.9% were primary school graduates, 57.4% were ASA 1, 73% were It was determined that 0 patients had surgical experience, 79.1% received general anesthesia, and 58.3% did not experience more pain than expected. The pain level experienced by the patients was found to be 3.27±2.04 (Table 1).

The average score of the patients from the organic beliefs sub-dimension of the scale was 2.43±0.60, and the average score from the psychological beliefs sub-dimension was 2.39±0.63 (Table 2).

It was determined that the average score of the patients in the organic beliefs sub-dimension was due to surgical experience, and the average score of the patients in the psychological beliefs sub-dimension was statistically significantly different compared to their ASA scores (p <0.05) (Table 3).

It was determined that there was a positive relationship between organic beliefs and psychological beliefs, and a negative relationship between psychological beliefs and postoperative pain severity (p<0.05) (Table 4).

Table 4

Relationship between postoperative pain level and pain beliefs

		Organic Beliefs	Psychological Beliefs	Pain Level
Organic Beliefs	Pearson	1.000	0.310**	-0.133
	p	.	0.001	0.156
	N	115	115	115
Psychological Beliefs	Pearson		1.000	-0.225*
	p		.	0.015
	N		115	115
Pain Level	Pearson			1.000
	p			.
	N			115

*α significance level was taken as 0.05, p: used test statistic value, N: number

4. Discussion

Pain experience varies widely among patients. Pain beliefs can be defined as cognitions or thoughts about the problem of pain[9]. Although modifiable, the fundamental characteristics of beliefs can make them difficult to identify and target; because beliefs are not always rational, that is, they can persist even after the facts are presented[12]. The findings obtained as a result of the analysis of the research data were discussed in the light of the relevant literature. The findings examined emphasize the importance of taking pain beliefs into account in the preoperative period.

The average score of the patients in the organic beliefs sub-dimension of the scale was 2.43±0.60, and the average score in the psychological beliefs sub-dimension was 2.39±0.63. Disceken and Kose reported that patients who underwent abdominal surgery and had high-intensity pain in the first 24 hours postoperatively had higher organic and psychological pain beliefs[10]. Both this study and the studies in the literature suggest that pain beliefs may have an active role in the pain experienced by surgical patients, and that learning the pain beliefs of surgical patients, as well as implementing nursing interventions to correct false and negative pain beliefs, can help surgical nurses provide effective postoperative pain control[1,5,10]. The fact that organic and psychological beliefs scores vary according to studies suggests that pain beliefs arise from variables such as medical diagnosis, location of pain, severity of pain, and age.

In the literature, postoperative pain; It is stated that the patient's personal characteristics, education, culture, beliefs about pain, knowledge and experience, preoperative preparation process, type of surgery, location, duration, complications, anesthetic techniques applied, and the nature and quality of the postoperative period are affected[3,5,20]. In the study, it was determined that the average score of the patients in the organic beliefs sub-dimension was affected by surgical experience, and the average score in the psychological beliefs sub-dimension was affected by the ASA scores. This finding shows that there is a significant relationship between patients' pain beliefs and ASA scores. Possibly, patients with high ASA scores focus more on pain to cope with more serious health problems, which may have an impact on their organic beliefs. These results highlight the importance of considering psychological and medical factors together when assessing patients' pain perception and management. These differences are closely related to the way patients perceive pain and the meaning they attribute to pain[21].

Health professionals should determine patients' pain-related beliefs in the preoperative period, understand patients' beliefs, and adapt pain management strategies accordingly. In the study, a positive moderate relationship was found between organic beliefs and psychological beliefs, and a negative low level of relationship between psychological beliefs and postoperative pain level. It is stated in the literature that there is a significant relationship between the severity of pain and organic pain beliefs and that organic pain beliefs and psychological pain beliefs affect each other. Studies show that patients with negative pain beliefs experience more pain in the postoperative period[8,22-25]. In Bağcı's study on transplant patients, which is one of the limited studies examining pain beliefs in surgical patients, it is reported that both psychological and organic pain beliefs of patients with high pain levels are parallelly high[14]. In their study on the subject, Babadağ and Alparslan reported that the level of pain is affected by the relationship between organic and psychological beliefs about pain[26]. In the study conducted by Ursavaş and Yaradılmış, it was stated that there was no relationship between the level of pain experienced after total knee and hip replacement surgery and pain beliefs[11]. Despite this, although there are studies on pain in urological surgery in the literature[27] no study has been found that specifically reveals the characteristics that affect pain beliefs.

4.1. *Limitations of the research*

The findings obtained are limited to the answers given by the patients participating in the research. It is important to regularly evaluate pain belief levels. It would be useful to organize training sessions to increase their awareness on this issue. Conducting interpretive qualitative research as well as comprehensive survey-type research in scientific studies will enable the subject to be examined in depth.

5. Conclusion

As a result, it appears that urology patients' pain beliefs in the preoperative period have a significant effect on postoperative pain level. It was concluded that patients believed that the pain had both psychological and organic origins. In addition, it can be said that patients with a high belief that the pain is of psychological origin have lower pain level. For this reason, surgical nurses should focus on understanding and improving patients' pain beliefs and developing new approaches. In this context, it may be recommended that surgical nurses determine the factors affecting patients' pain beliefs with larger and different sample groups and provide counseling to improve their pain beliefs.

Statement of ethics

Ethical approval was obtained from the Cukurova University Faculty of Medicine Clinical Research Ethics Committee and the study was conducted by the principles of the Declaration of Helsinki (Decision no: 135/40 Date: 14.07.2023).

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Retrospective Analysis of Intradiscal Radiofrequency Decompression Therapy in Lumbar Disk Herniation

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Abstract

Aim: This study evaluates the effects of demographic and clinical factors on surgical outcomes in patients undergoing lumbar decompression surgery. Specifically, the relationships between gender, age, presence of degeneration, lesion location, body mass index (BMI), and Visual Analog Scale (VAS) scores were analyzed.

Methods: This retrospective study was conducted on 57 patients who underwent lumbar decompression surgery. Demographic data, clinical findings, and surgical outcomes were recorded. Data were evaluated using statistical analyses such as t-tests, Mann-Whitney U tests, and ANOVA.

Results: No significant difference was found between gender and VAS scores (p = 0.783). The presence of degeneration significantly increased VAS scores (p = 0.0096), with patients with degeneration reporting higher pain (VAS = 4.79) compared to those without degeneration (VAS = 4.39). The average age of patients with degeneration was 51.14 years, compared to 43.14 years for those without (p = 0.0029). No significant difference was found between lesion location and VAS scores (p = 0.603). However, multilevel lesions were associated with higher VAS scores. A weak but significant positive correlation was found between BMI and VAS scores (r = 0.35).

Conclusion: Postoperative pain management in lumbar decompression surgery is significantly influenced by factors such as the presence of degeneration, lesion location, and BMI. This study emphasizes the importance of considering these factors when formulating personalized treatment plans during preoperative evaluations. Future research may help validate these findings in larger patient populations and aid in developing new strategies to improve surgical outcomes.

***Keywords**: Radiofrequency thermocoagulation, nucleoplasty, lumbar decompression*

1. Introduction

Lumbar decompression surgery is a widely used surgical method for treating degenerative spine diseases, such as herniated discs and spinal stenosis.[1] Factors such as aging, genetic predisposition, and lifestyle can accelerate spinal degeneration, leading to chronic pain that necessitates surgical intervention.[2] This study aims to examine the impact of demographic and clinical characteristics on surgical outcomes in patients undergoing lumbar decompression surgery. Parameters such as gender, age, presence of degeneration, lesion location, body mass index (BMI), and Visual Analog Scale (VAS) scores were assessed.

However, the challenges associated with decompression, including the prevalence of pain, associated risk factors, and impact on clinical management, are poorly understood.

In particular, there is a significant lack of data on the evaluation of pain management using decompression techniques and the demographic or clinical variability associated with this approach. As a result, clinicians face challenges in planning and managing the risks, methodologies, and complications associated with decompression therapy in patients with lumbar disc herniation. This study aims to present and share our clinical experience with the method.

This study presents important factors related to the management of low back and leg pain, especially in patients with radiculopathy.

2. Materials And Methods

Since all patients who applied to the algology clinic and were clinically followed were included in the study, a power analysis was not performed.

Inclusion Criteria:

• Patients who received Radiofrequency or Cryoablation treatment due to chronic pain

• Patients evaluated with VAS in the preoperative and postopera-

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tive periods
• Patients with at least 6 months of follow-up after treatment

Exclusion Criteria:
• Patients who had previously received the same treatment methods
• Individuals with neurological or musculoskeletal diseases
• Patients not followed up for 6 months after treatment

In this retrospective study, 57 patients were evaluated. Demographic data (gender, age, BMI), clinical findings (presence of degeneration, lesion location), and surgical outcomes (VAS scores) were collected. Statistical analyses were performed using t-tests, Mann-Whitney U tests, and ANOVA to compare differences between groups. All analyses were conducted using SPSS software.

2.1. Procedure Technique

The patient is positioned prone in the operating room, with a pillow placed under the abdomen. After local cleaning and sterile draping, the relevant disc space is identified under fluoroscopy. The C-arm is adjusted to achieve optimal imaging in a caudal-cephalad oblique position, followed by a lateral oblique position.[3,4] Once the relevant disc space is marked, the skin and subcutaneous tissues are infiltrated with a local anesthetic. A 17-gauge guiding needle is advanced toward the disc, with depth controlled via A-P and lateral images. The needle is advanced to the boundary of the annulus fibrosus and nucleus pulposus. The needle's position is stabilized using a special device. A pulse radiofrequency is applied at 42°C for 4 minutes. At the end of the procedure, the needle is withdrawn, and the procedure is concluded.

3. Results

The demographic characteristics of the patients participating in the study are presented in Table 1.

A significant relationship was found between the presence of degeneration and age (p = 0.0029). The average age of patients with degeneration was 51.14 years, while it was 43.14 years for those without.[4,5]

A significant difference was found between the presence of degeneration and VAS scores (p=0.0096). Patients with degeneration reported average VAS scores of 4.79, while those without reported scores of 4.39.[6,7]

Figure 1

Degeneration and VAS Scores

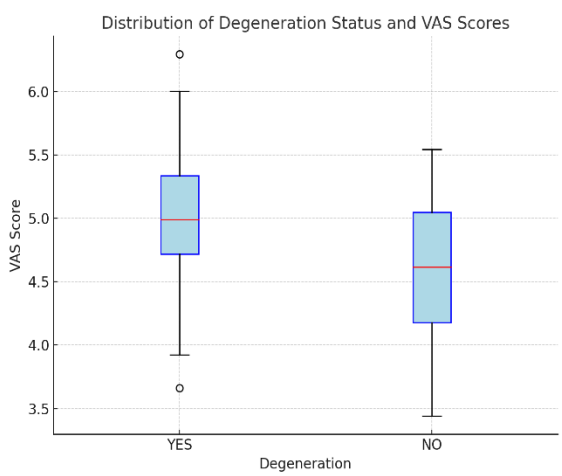

Figure 2

Lesion Location and VAS Scores

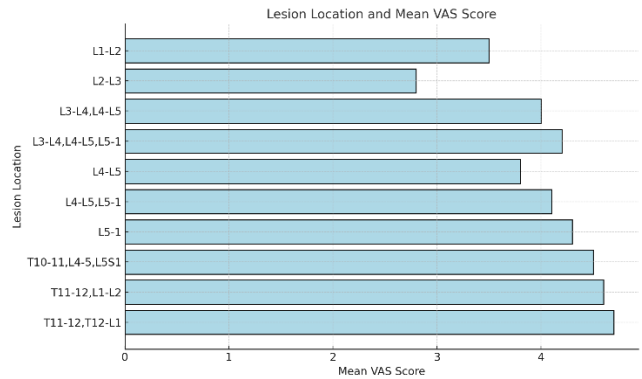

Figure 3

BMI and VAS Scores Relationship

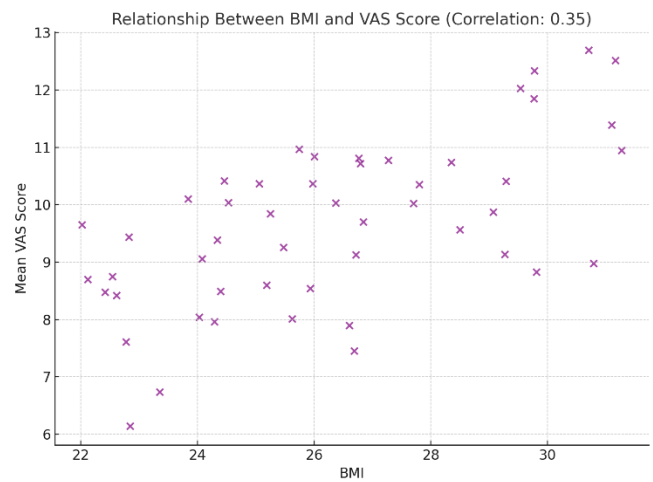

Table 1

Demographic Data

Category	Detail	Count	Percentage (%)
Gender	Male	29	50.9
	Female	28	49.1
Age	Average Age	-	47.2
Median Age		-	45.0
Age Range		-	26-68
Degeneration	Present	29	50.9
	Absent	28	49.1
Previous Surgery	Present	7	12.3
	Absent	50	87.7

There was no statistically significant difference between lesion location and VAS scores (p = 0.603). However, higher VAS scores were observed in patients with multilevel lesions.

A weak but significant positive correlation was found between BMI and VAS scores (r = 0.35). Patients with higher BMI reported generally higher VAS scores. [8,13] (figure 3)

4. Discussion

The findings of this study detail various demographic and clinical factors influencing surgical outcomes after lumbar decompression surgery. This discussion includes a comparison of these findings with the literature and our recommendations for clinical practice.

In our study, no significant effect of gender on VAS scores was found (p = 0.783). There was no noticeable difference in VAS scores between male and female patients. This finding suggests that pain perception after lumbar decompression surgery is not directly associated with gender. Conflicting findings exist in the literature regarding the impact of gender on pain perception; while some studies indicate women report higher pain scores post-surgery[10,14], others find no significant role for gender in pain management.

The presence of degeneration was identified as a significant factor that increases VAS scores (p = 0.0096). Patients with degeneration reported higher pain scores compared to those without. This finding confirms the adverse effects of degenerative spinal diseases on surgical outcomes and suggests that postoperative pain management may be more challenging in these patients.[6,7] Moreover, degeneration correlated positively with age; the increasing prevalence of degeneration among older patients indicates that they may require more intensive postoperative pain management.

The impact of lesion location on VAS scores was minimal; however, higher VAS scores were observed in patients with multilevel lesions. This finding may be explained by the increased tissue trauma associated with more extensive surgical interventions.[9,10,12] It is known that multilevel spinal surgeries can be more complex and challenging, particularly in patients with significant degenerative changes.

The weak but positive correlation between BMI and VAS scores (r = 0.35) raises considerations about the potential effects of factors such as obesity on surgical outcomes. High BMI is often associated with increased postoperative complication rates and prolonged recovery times.[8,9,13] In our study, higher BMI was associated with elevated VAS scores, suggesting that pain management post-surgery may be more difficult in patients with high BMI. This highlights the importance of preoperative weight management strategies for patients with high BMI to improve surgical outcomes.

The findings of this study reveal several factors influencing surgical outcomes in patients undergoing lumbar decompression surgery. Particularly, the presence of degeneration and high BMI emerged as significant factors that increase postoperative pain levels. Surgeons should conduct thorough preoperative evaluations for such patients and adopt more intensive pain management strategies in the postoperative period. Additionally, elderly patients with degenerative changes should be monitored more closely after surgery.[11,15]

Considering that lesion location did not have a significant impact on postoperative pain, the choice of surgical approach should primarily be based on the patient's overall health status and surgical risks. However, it is important to remember that patients planned for multilevel spinal surgeries may experience longer and more complicated recovery processes.

5. Conclusion

This study emphasizes the importance of personalized approaches in postoperative pain management following lumbar decompression surgery. Careful evaluation of patients' demographic and clinical characteristics can contribute to better outcomes in surgical planning and postoperative care. Future studies may validate these findings in larger patient populations and aid in developing strategies to enhance the effectiveness of lumbar decompression surgeries.

Statement of ethics

Ethical permission was obtained from the Adana City Training and Research Hospital Clinical / Human Research Ethics Committee for this study date on October 11, 2024, and decision number 150 and Helsinki Declaration rules were followed to conduct this study.

Source of Finance

The authors declare that they have received no financial support for this study

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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