ISSUE
1
YEAR: 2024 VOLUME: 5

ARCHIVES OF
CURRENT MEDICAL
RESEARCH

ARCHIVES OF CURRENT MEDICAL RESEARCH

https://dergipark.org.tr/tr/pub/acmr

ARCHIVES OF CURRENT MEDICAL RESEARCH (ACMR)

Volume: 5

Number: 1

January 2024

Publishing Language
English

E-ISSN
2717-9788

Type of Publication
Peer Reviewed Academic Journal

Publishing Period
Three Times a Year (January, May, September)

Journal Name
Archives of Current Medical Research
Arch Curr Med Res

Owner
14th March Medical Association

General Publication Director
Mehmet Ali Tokgöz

Management Location - Content Advisor
Alban Tanıtım Ltd. Şti.
Tunalı Hilmi Cad. Büklüm Sokak No: 45/3
Kavaklıdere/Ankara Tel: 0.312 430 13 15
E-mail: info@acmronline.org
editor@albantanitim.com.tr

Graphic Design
Alban Tanıtım Ltd. Şti.

Proofreading
S. Bahar Alban

Prepress
Alban Tanıtım Ltd. Şti.

ARCHIVES OF CURRENT MEDICAL RESEARCH

EDITORIAL TEAM

TABLE OF CONTENTS

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):1-6

Received: 29 October 2023
Revised: 1 January 2024
Acccepted: 24 January 2024
DOI: 10.47482/acmr.1413317

REVIEW ARTICLE

Subscapularis tendon tears: A narrative review

İlhan Çelik[1] Tacettin Ayanoğlu[2] Günbay Noyan Dirlik[1] Mustafa Odluyurt[3] Abdurrahman Vural[4] Fatih İlker Can[5] Mustafa Yasin Hatipoğlu[6] Semih Yaş[7] Batuhan Bahadır[8]

1 Alanya Education and Training Hospital, Department of Orthopedics and Traumatology, Alanya, Antalya, Turkey
2 Bolu Abant Izzet Baysal University Medical Faculty, Department of Orthopedics and Traumatology, Bolu, Turkey
3 Çaycuma State Hospital, Department of Orthopedics and Traumatology, Zonguldak, Turkey
4 Başakşehir Çam and Sakura City Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey
5 Muğla Education and Training Hospital,Department of Orthopedics and Traumatology, Muğla, Turkey
6 Hand and Upper Extremity Surgeon, Private Clinic, Ankara, Turkey
7 Gazi University, Faculty of Medicine, Department of Orthopedics and Traumatology, Ankara, Turkey
8 Ankara Bilkent City Hospital, Department of Orthopedics and Traumatology, Ankara, Turkey

Abstract

The subscapularis muscle, which is the strongest muscle of the rotator cuff, plays important roles in shoulder biomechanics and stability. The emergence of a significant percentage of subscapular tendon tears in rotator cuff tears with advancing arthroscopic techniques has brought the importance of subscapular repair to the agenda along with different dynamics to the arthroscopic perspective. Patient training will reduce postoperative patient morbidity in addition to physical examination, imaging, and medical and surgical approaches to the treatment.

Keywords: M. Subscapularis Tendon, Shoulder, Arthroscopic Repair.

Cite this article as: *Çelik İ, Ayanoğlu T, Dirlik Noyan G, Odluyurt M, Vural A, Can Fİ, Hatipoğlu MY, Yaş S, Bahadır B. Subscapularis tendon tears: A narrative review. Arch Curr Med Res. 2024;5(1):1-6*

Corresponding Author:
İlhan Çelik, Alanya Education and Training Hospital, Department of Orthopedics and Traumatology, Alanya, Antalya, Turkey
E-Mail: drilhanc@gmail.com

INTRODUCTION

The shoulder is a complex joint that has a complex network of bones, ligaments, muscles, and neurovascular anatomy along with a wide range of motion and functional requirements (1). The subscapularis muscle, which is the largest and strongest muscle of the rotator cuff, plays important roles in shoulder stability and function (2).

The subscapular muscle fills the subscapular fossa providing 50% of the total strength of the rotator cuff. It also plays roles with its triangular shape in balancing the force couples of the glenohumeral joint and in internal rotation and abduction of the shoulder (3). Its upper two-thirds attaches to the minor tuberosity as a tendon after passing under the coracoid, and its lower third attaches to the metaphysis of the proximal humerus as a muscle (4). The superolateral part of the subscapularis is in close relationship with the superior glenohumeral and coracohumeral ligament (5). The nerve subscapular innervates the subscapular muscle (6).

Subscapular tears are frequently detected in forced external rotation with abduction or forced extension (7). Subscapularis tears are more frequent than expected with the development of modern arthroscopic techniques and greatly affect the quality of life (8). Although isolated subscapular tears are frequent in the young population (4%) (9), subscapular tears are detected in 40% of shoulder cuff tears (4). In the present study, the clinical characteristics, diagnostic methods, treatment options, and rehabilitation procedures of subscapularis muscle tears, which affect the comfort of life significantly, are explained comprehensively.

Subscapularis Tears and Classification

Classifying the subscapular tendon tears is of prognostic importance for preoperative preparation and planning appropriate treatment. Many suggestions were offered in the past for the classification of subscapular tendon tears, but no strong decision has been reached yet. Some of these classifications are diagnostic in physical examination, some in ultrasonography, and some in CT arthrography. Yoo and Rhee, Fox and Romeo's, Martetschlager, Lyon, Toussaint, Dierckman classifications are the classifications used in the repair of subscapular tendon tears (10). According to a survey that was conducted among elbow and shoulder surgeons in America in 2023, it was reported that the Lafosse Classification is more appropriate for the most appropriate diagnosis and treatment (11).

Table 1. Classification of Lafosse et al. regarding subscapular tendon tears (12)

Type 1	Partial tear and erosion on the superior third of the subscapularis
Type 2	Complete detachment of the superior third of the subscapularis
Type 3	Complete detachment of the superior two-thirds of the subscapularis without involvement of the inferior one-third muscular part (limited tendon retraction)
Type 4	Complete subscapularis tear from the humeral insertion (well-centered humeral head and fatty infiltration involving less than or equal to grade 3 tear)
Type 5	Complete subscapularis tear from the humeral insertion with humeral head anterosuperior subluxation and contact with the coracoid (associated with fatty infiltration)
Plug	Isolated deep layer SC tendon tear (for visualization it is required to elevate the subscapularis tendon by the probe)

The Etiology of Subscapular Tendon Tears

Many subscapular tears occur as a result of a strong contraction in sudden accidents and traumas (13). Partial or complete tears might occur as a result of repetitive chronic overuse, especially in manual workers and athletes (14). Non-traumatic tears might occur as a result of decreased elasticity in muscle tissue with advancing age (15). Biomechanical abnormalities (16) and inadequate body alignment (17) cause potential tears over time and genetic predisposition (18) plays important roles in this respect. In the shoulder joint, inflammatory conditions (e.g., tendinitis and bursitis) can weaken the subscapular tendon and cause ruptures if not managed well (19).

Another approach is that the subscapularis tendon increases the tensile loads on the joint surface, causing tension undersurface fiber failure at the subscapularis insertion. Subcoracoid stenosis and subcoracoid impingement contribute to the pathogenesis of subscapularis tendon tears by causing a "roller-wringer effect" on the subscapularis tendon (20).

The Symptoms of Subscapular Tendon Tears

The presence of pain increasing with internal rotation or overhead exercises is a characteristic indicator of

subscapularis tears (21). Subscapularis injuries might result in a limited range of motion in the abduction and internal rotation. Patients might also face difficulties in raising their arms above their heads or feel discomfort while doing certain actions. Determining the degree of mobility restriction facilitates determining the extent of the tear (13). Patients might encounter pain within a defined range of movement, commonly during the middle phase of moving the limb away from the body and rotating it outward. Identifying the specific range of movement that causes discomfort helps to determine the damaged structures and direct additional diagnostic investigations (22). Some persons experiencing subscapularis tears might have a perception of catching or clicking in the shoulder joint when performing specific movements. These sensations might suggest the presence of structural problems and can help direct additional diagnostic tests (23). Commonly, clinical examinations reveal tenderness in the anterior shoulder region, particularly localized over the subscapularis muscle. By palpating this region, the clinician can pinpoint the origin of pain and discomfort, hence enhancing the precision of the diagnosis (21). An indicative indication is the exacerbation of pain during nighttime, especially when reclining on the afflicted shoulder. Nocturnal pain can greatly affect the quality of sleep and is frequently an indication of an underlying subscapularis disease (24). Subscapularis rips can lead to muscular atrophy in circumstances that are persistent or severe. Measurable alterations in muscle size, specifically in the front region of the shoulder, can suggest the presence of long-lasting or significant injuries (25).

Physical Examination Findings and Imaging Techniques

Detailed anamnesis, physical examination, and imaging make up the pillars of diagnosis in patients presenting with shoulder complaints. Physical examination and imaging are a whole. It is argued that only imaging without physical examination might not be compatible with the actual treatment and might cause unnecessary and excessive treatment modalities to be applied (26). The functionality of the subscapularis is evaluated with the Dynamic Lift-Off Test, bear-hug test, and Belly Press Test performed during the physical examination (27). Among these tests, the bear-hug test can be considered the most likely clinical test to detect a tear in the upper part of the subscapularis tendon. Performing all subscapularis physical examination tests at the same visit is useful in estimating the size of the tear (28). Long biceps head tendon sheath effusion >2 mm on USI (29), subscapularis tendon tear from the lesser tuberosity in the axial plane on Magnetic Resonance Imaging (MRI), Long Head of the Biceps (LHB) tendon subluxation, subscapularis muscle belly atrophy in the sagittal plane, torn subscapularis fibers and bare lesser tuberosity are important findings in subscapular tendon ruptures (11). Bone marrow edema, cysts, and fat atrophy in the tuberculum minor are the symptoms of chronic tears (30). In addition, although no subscapular tear is seen in the MRI findings of patients whose surgery is planned due to rotator cuff tear, the presence of subcoracoid effusion should bring to mind intraoperative subscapular evaluation (31).

No doubt, the best imaging is Shoulder Arthroscopy, which serves both diagnosis and treatment simultaneously (32). When the Comma Sign is in the upward retraction of the superior glenohumeral ligament and coracohumeral ligament, it is an important symptom in full-thickness subscapular tears in arthroscopy (33).

Artificial intelligence and machine learning algorithms have attracted great attention in recent years as a promising, innovative approach to diagnosis (34). According to a machine learning study conducted for the diagnosis of subscapular tendon tears, it was found that MRI alone was successful in predicting subscapularis tears in 85% of patients, and this machine learning increased the accuracy and sensitivity in diagnosis (35). However, advanced and large-scale studies on machine learning are still needed.

Treatments

Less active, older patients with smaller atraumatic tears should first enter a conservative treatment plan consisting of physical therapy, anti-inflammatories, and activity modifications (36). Shoulder joint strengthening exercises and electrical stimulation help increase range of motion and NSAIDs can provide both physiopathological and symptomatological relief for inflammation (37, 38). The patient must be shown which movements to avoid (21). Corticosteroid injections might be utilized because of their anti-inflammatory characteristics. Injected directly into the subacromial region or shoulder joint, these injections offer brief alleviation of discomfort and inflammation. It should be kept in mind that there may be atrophy in the muscle, and it should not be forgotten that it may pave the way for new tears in the tendon (39, 40). Platelet-Rich Plasma (PRP) and Stem Cell Therapy are widely

preferred in biological interventions today. PRP injections entail the utilization of concentrated platelets from the patient's own blood to promote the process of healing. This regenerative method has the potential to enhance tissue healing in instances of subscapularis rips (41, 42). Stem cell therapy investigates the regenerative capacity of stem cells to assist in the restoration of damaged tissues. Ongoing research in this field shows promise for treating subscapularis injuries (43, 44). While symptomatic relief is observed in conservative treatments, it should be kept in mind that complete recovery may not occur and the patient should be informed about this. In addition, conservative treatments have a lower success rate and are not cost effective compared to the surgical approach (45).

Patients unresponsive to conservative treatment may be candidates for surgical intervention. Early surgical intervention in patients with traumatic tears will likely yield better outcomes (46). Arthroscopic repair is performed in the surgical approach by suturing the subscapular tear under the guidance of an arthroscope (44). Open repair can be performed for specific anatomical factors with a large incision, but postoperative recovery time might be prolonged (47). In artroscopic repair, the typical posterior portal is necessary in addition to the anterosuperior and anterior portals for arthroscopic surgery to repair the subscapularis. First, a portal is established on the anterolateral side. The ideal position and alignment of the portal should be parallel to the subscapularis fibers at a certain angle, enabling access to the tuberculum minus of the humerus for suturing purposes (48). Through examination of the biceps tendon is necessary during surgery. If it is determined to be required, pathological tendons can be treated with either total tenotomy or tenodesis. Medial subluxation should be assessed in non-pathological tendons (49). Due to the subscapularis tendon's attachment site providing anterior support to the biceps long head groove, dislocation of the biceps long head tendon can exert pressure on the subscapularis tendon, resulting in repair failure. If faced with such a circumstance, biceps tenotomy or tenodesis may be suitable options (50).

The coracoid prominence is readily identifiable since it is positioned just at the center of the anterior portal entry and directly above the subscapularis tendon (51). The axillary artery and vein, long thoracic nerve, and brachial plexus are located nearby (52). Furthermore, one may see the presence of compound tendons originating from the short head of the biceps and coracobrachialis, together with the attachment of the pectoralis minor muscle (53). Burkhart suggests that in cases of partial tear of the subscapularis muscle, coracoplasty can be performed by establishing a window in the rotator interval. It is important to maintain the integrity of the biceps' medial tether and the superior glenohumeral ligament (SGHL) throughout this treatment (54).

The objective of coracoplasty is to establish a coracohumeral spacing of 7-10 mm, hence reducing friction during the subscapularis healing process (55). Following complete tears, the subscapularis muscle will progressively retract over a period of time. In instances of severe retraction, it is possible for it to have shifted medially to the extent of the glenoid labrum (21). This adds complexity to the process of selecting the allocation for tenodesis during subscapularis repair. In such instances, the "comma sign," as elucidated (32). The comma sign denotes the superolateral surface where the subscapularis tendon is distinguished from the humeral head. In essence, it is a leftover part of the middle connection of the biceps muscle (56).

Postoperative physical rehabilitation must be planned according to the type of the subscapularis tear and individual characteristics for the regeneration of strength, flexibility, and functional movements (57). For proactive prevention in physical rehabilitation, shoulder conditioning, effective preparatory exercises and flexibility training, and gradual progressive activities will improve shoulder multifaceted function (58). Periodic checks along with pain management will optimize patient outcomes.

Declarations

The authors have no conflicts of interest to declare. The authors declared that this study has received no financial support. Ethics committee approval is not required

REFERENCES

1. Bakhsh W, Nicandri G. Anatomy and physical examination of the shoulder. Sports Med Arthrosc Rev. 2018 ;26(3):e10-e22.
2. Longo UG, Berton A, Marinozzi A, Maffulli N, Denaro V. Subscapularis tears. Med Sport Sci. 2012;57:114-121.
3. Keating JF, Waterworth P, Shaw-Dunn J, Crossan J: The relative strengths of the rotator cuff muscles. A cadaver study. J Bone Joint Surg Br 1993;75:137– 140.
4. Arai R, Sugaya H, Mochizuki T, Nimura A, Moriishi J, Akita K: Subscapularis tendon tear: an anatomic and clinical investigation. Arthroscopy 2008;24:997– 1004.

5. Richards DP, Burkhart SS, Tehrany AM, Wirth MA: The subscapularis footprint: an anatomic descrip- tion of its insertion site. Arthroscopy 2007;23:251– 254.
6. Siwetz M, Hammer N, Ondruschka B, Kieser DC. Variations in subscapularis muscle innervation-a report on case series. Medicina (Kaunas). 2020;56(10):532.
7. Gerber C, Hersche O, Farron A. Isolated rupture of the subscapularis tendon. Results of operative repair. J Bone Joint Surg 1996;78:1015-23.
8. Lee J, Shukla DR, Sánchez-Sotelo J. Subscapularis tears: hidden and forgotten no more. JSES Open Access. 2018;2(1):74-83.
9. Edwards TB, Bradley Edwards T, Walch G, Nove-Josserand L, Boulahia A, Neyton L, et al. Arthroscopic debridement in the treatment of patients with isolated tears of the subscapularis. Arthroscopy 2006;22:941-6.
10. Saremi H, Seifrabiei M. Subscapularis tendon tear classification and diagnosis: A systemic review and meta-analysis. Front Surg. 2023;10:916694.
11. Ghasemi SA, McCahon JAS, Yoo JC, Toussaint B, McFarland EG, Bartolozzi AR, Raphael JS, Kelly JD. Subscapularis tear classification implications regarding treatment and outcomes: consensus decision-making. JSES Rev Rep Tech. 2023;3(2):201-208.
12. Lafosse L, Lanz U, Saintmard B, Campens C. Arthroscopic repair of subscapularis tear: surgical technique and results. Orthop Traumatol Surg Res 2010;96:S99- 108.
13. Clark RJ, Marchessault J, Sizer PS Jr, Slauterbeck J. Isolated traumatic rupture of the subscapularis tendon. J Am Board Fam Pract. 2002;15(4):304-8.
14. Gerber C, Krushell RJ. Isolated rupture of the tendon of the subscapularis muscle. Clinical features in 16 cases. J Bone Joint Surg Br. 1991;73(3):389-94.
15. Balke M, Banerjee M, Greshake O, Hoeher J, Bouillon B, Liem D. The coracohumeral distance in shoulders with traumatic and degenerative subscapularis tendon tears. Am J Sports Med. 2016;44(1):198-201.
16. Lo IK, Burkhart SS. The etiology and assessment of subscapularis tendon tears: a case for subcoracoid impingement, the roller-wringer effect, and TUFF lesions of the subscapularis. Arthroscopy. 2003;19(10):1142-50.
17. Houglum PA. Rehabilitation for subacromial impingement starts at the scapula. J Orthop Trauma Rehabil. 2013;17:54-60.
18. Plachel F, Moroder P, Gehwolf R, Tempfer H, Wagner A, Auffarth A, et al, risk factors for rotator cuff disease: An experimental study on intact human subscapularis tendons. J Orthop Res. 2020;38(1):182-191.
19. Park HB, Gwark JY, Na JB. Risk factors of chronic subscapularis tendon tear. Clin Shoulder Elb. 2022;25(4):257-264.
20. Lo IK, Burkhart SS. The etiology and assessment of subscapularis tendon tears: a case for subcoracoid impingement, the roller-wringer effect, and TUFF lesions of the subscapularis. Arthroscopy. 2003;19(10):1142-50.
21. Goldberg DB, Tamate TM, Hasegawa M, Kane TJK 4th, You JS, Crawford SN. Literature review of subscapularis tear, associated injuries, and the available treatment options. Hawaii J Health Soc Welf. 2022;81(3 Suppl 1):2-7.
22. Rigsby R, Sitler M, Kelly JD. Subscapularis tendon integrity: an examination of shoulder index tests. J Athl Train. 2010;45(4):404-6.
23. Bak K. The practical management of swimmer's painful shoulder: etiology, diagnosis, and treatment. Clin J Sport Med. 2010;20(5):386-90.
24. Mengi A, Akif Guler M. Nocturnal pain in patients with rotator cuff related shoulder pain: A prospective study. Musculoskelet Sci Pract. 2022;59:102536.
25. Seppel G, Voss A, Henderson DJH, Waldt S, Haller B, Forkel P, et al. Atrophy patterns in isolated subscapularis lesions. BMC Musculoskelet Disord. 2021;22(1):378.
26. Günay C. Investigation of clinical effectiveness of specific shoulder examination tests, Osmangazi Journal of Medicine, 2020;42(6):670-681
27. Wahezi SE, Duarte R, Kim C, Sehgal N, Argoff C, Michaud K, et al. An algorithmic approach to the physical exam for the pain medicine practitioner: A review of the literature with multidisciplinary consensus. Pain Med. 2022;23(9):1489-1528.
28. Barth JR, Burkhart SS, De Beer JF. The bear-hug test: a new and sensitive test for diagnosing a subscapularis tear. Arthroscopy. 2006;22(10):1076-84.
29. Lee J, Shukla DR, Sánchez-Sotelo J. Subscapularis tears: hidden and forgotten no more. JSES Open Access. 2018; 2(1):74-83.
30. Wang Q, Zhao J, Zhou S, Lv Y, Liu X, Yang H. Quantitative MRI indicators and features for partial subscapularis tendon tears on conventional shoulder MRI. Insights Imaging. 2022;13(1):168.
31. Sarıkaya B, Bahadır B, Kaya İ, Oklaz B, Bekin Sarıkaya PZ, Kanatlı U. Can subcoracoid effusion be a more specific finding for subscapularis tear among rotator cuff pathologies on magnetic resonance imaging? J Shoulder Elbow Surg. 2023;32(1):17-23.
32. Bhatnagar A, Bhonsle S, Mehta S. Correlation between MRI and arthroscopy in diagnosis of shoulder pathology. J Clin Diagn Res. 2016;10(2):RC18-21.
33. Aiken AJ, Field LD. Techniques and tips for identification of comma tissue in subscapularis tears. Arthrosc Tech. 2020 ;9(7):e859-e862.
34. Rodriguez HC, Rust B, Hansen PY, Maffulli N, Gupta M, Potty AG, et al. Artificial intelligence and machine learning in rotator cuff tears. Sports Med Arthrosc Rev. 2023;31(3):67-72.
35. Oeding JF, Pareek A, Nieboer MJ, Rhodes NG, Tiegs-Heiden CA, Camp CL, et al. A machine learning model demonstrates excellent performance in predicting subscapularis tears based on pre-operative imaging parameters alone. Arthroscopy. 2023;S0749-8063(23)00766-1.
36. Sewick A, Kelly J, Leggin B. Subscapularis tears: diagnosis and treatment. Univ Pa Orthop J. 2011;21:25-30.
37. Brusalis CM, Chan JJ, Jackson GR, Khan ZA, Kaplan DJ, Allahabadi S, et al. Advanced subscapularis repair techniques. Oper Tech Sports Med. 2023;31(1); 150981.
38. Boudreault J, Desmeules F, Roy JS, Dionne C, Frémont P, Macdermid JC. The efficacy of oral non-steroidal anti-inflammatory drugs for rotator cuff tendinopathy: a systematic review and meta-analysis. J Rehabil Med. 2014;46(4):294-306.
39. Gruson KI, Ruchelsman DE, Zuckerman JD. Subacromial corticosteroid injections. J Shoulder Elbow Surg. 2008;17(1 Suppl):118S-130S.
40. Sengodan VC, Kurian S, Ramasamy R. Treatment of partial rotator cuff tear with ultrasound-guided platelet-rich plasma. J Clin Imaging Sci. 2017;7:32.
41. Harrison A, Shatsky J, Parsons B, Flatow E, Outcomes of open and arthroscopic subscapularis repairs (SS-18). Arthroscopy, 27(5), 2011; e38-e39.
42. Hernigou P, Flouzat Lachaniette CH, Delambre J, Zilber S, Duffiet P, Chevallier N, et al. Biologic augmentation of rotator cuff repair with mesenchymal stem cells during arthroscopy improves healing and prevents further tears: a case-controlled study. Int Orthop. 2014:1811-8.
43. Oh JH, Chung SW, Kim SH, Chung JY, Kim JY. 2013 Neer Award: Effect of the adipose-derived stem cell for the improvement of fatty degeneration and rotator cuff healing in rabbit model. J Shoulder Elbow Surg. 2014 :445-55.
44. Burkhart SS, Tehrany AM. Arthroscopic subscapularis tendon repair: Technique and preliminary results. Arthroscopy. 2002 18(5):454-63.

45. Edwards P, Ebert J, Joss B, Bhabra G, Ackland T, Wang A. Exercise rehabilitation in the non-operative management of rotator cuff tears: A review of the literature. Int J Sports Phys Ther. 2016;11(2):279-301.
46. Warner JJ, Higgins L, etal. Diagnosis and treatmen to fanterosu periorro tato rcufftears. J Shoulder Elbow Surg. 2001;10:37-46.
47. Adams CR, Schoolfield JD, Burkhart SS. The results of arthroscopic subscapularis tendon repairs. Arthroscopy. 2008 24(12):1381-9.
48. Barlow JD, Everhart JS. Arthroscopic subscapularis repair through a single anterior portal. Arthrosc Tech. 2017;6(5):e1593-e1598.
49. Lalehzarian SP, Agarwalla A, Liu JN. Management of proximal biceps tendon pathology. World J Orthop. 2022;13(1):36-57.
50. Vopat ML, Yang SY, Gregor CM, Kallail KJ, Saunders BM. Medial dislocation of the long head of the biceps without concomitant subscapularis tear: A case report. J Orthop Case Rep. 2020;9(6):6-10.
51. Valenti P, Maroun C, Schoch B, Arango SO, Werthel JD. Arthroscopic trillat coracoid transfer procedure using a cortical button for chronic anterior shoulder instability. Arthrosc Tech. 2019;8(2):e199-e204.
52. Ahmed AS, Lafosse T, Graf AR, Karzon AL, Gottschalk MB, Wagner ER. Modern treatment of neurogenic thoracic outlet syndrome: Pathoanatomy, diagnosis, and arthroscopic surgical technique. J Hand Surg Glob Online. 2023;5(4):561-576.
53. Zielinska N, Tubbs RS, Podgórski M, Konschake M, Aragonés P, Grzelecki D, et al. Relationships among coracobrachialis, biceps brachii, and pectoralis minor muscles and their correlation with bifurcated coracoid process. biomed res int. 2022;2022:8939359.
54. Burkhart S.S., Brady P.C. Arthroscopic subscapularis repair: surgical tips and pearls A to Z. Arthroscopy. 2006;22:1014–1027.
55. Pearce SS, Ruzbarsky JJ, Ernat JJ, Rakowski DR, Hanson JA, Millett PJ. Arthroscopic subcoracoid decompression, coracoplasty, and subscapularis repair for subscapularis tears in the Setting of Subcoracoid impingement. Arthrosc Tech. 2022;11(3):e333-e338.
56. Dilisio MF, Neyton L. Comma sign-directed repair of anterosuperior rotator cuff tears. Arthrosc Tech. 2014;3(6):e695-8.
57. Altintas B, Bradley H, Logan C, Delvecchio B, Anderson N, Millett PJ. Rehabilitation following subscapularis tendon repair. Int J Sports Phys Ther. 2019;14(2):318-332.
58. Miranda H, Viikari-Juntura E, Martikainen R, Takala EP, Riihimäki H. A prospective study of work related factors and physical exercise as predictors of shoulder pain. Occup Environ Med. 2001a;58(8):528-34.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):7-11

Received: 22 August 2023
Revised: 23 January 2024
Acccepted: 24 January 2024
DOI: 10.47482/acmr.1347602

ORIGINAL ARTICLE

Evaluation of oral health awareness in pregnants

Suat Serhan Altıntepe Doğan[1] **Nebi Cansın Karakan**[1] **Özgür Doğan**[2]
İsmail Haktan Çelik[2] **Esra Nur Akgül**[2]

1 Afyonkarahisar Health Sciences University, Faculty of Dentistry, Department of Periodontology, Afyonkarahisar, Turkey
2 Afyonkarahisar Health Sciences University, Faculty of Dentistry, Department of Pediatric Dentistry, Afyonkarahisar, Turkey

Abstract

Background: This study aimed to evaluate the time-dependent effect of verbal and practical oral health education provided by dentists on 6- to 22-week-old pregnant women whose pregnancy is followed up by family physicians in health centers.

Methods: The study included fifty-four pregnant women participated. Oral hygiene education was given to the participants verbally and using a toothbrushing model. Periodontal indices such as the probing pocket depth (PPD), plaque index (PI) and gingival index (GI) were measured and recorded at the first and third month follow-up. The IBM SPSS v.26 statistical software was used for statistical analysis. All data were analyzed using the dependent t test.

Results: There was a statistically significant decrease in the PPD and PI parameters at the end of the one month ($p<0.05$). There was a decrease in the GI, yet it was not significant. At the end of the third month, there was a significant decrease in the PPD. There was a significant increase in the PI and GI ($p<0.05$).

Conclusion: Periodontal health status and oral hygiene habits should reach their optimum levels before pregnancy. In addition, follow-up appointments should be called during the whole pregnancy to ensure that oral hygiene habits are permanent.

Keywords: Oral and Dental Health Education, Preventive Dentistry, Pregnancy Education.

Cite this article as: *Alıntepe Doğan S S, Karakan N C, Doğan Ö, Çelik İ H, Akgül E N. Evaluation of oral health awareness in pregnants. Arch Curr Med Res. 2024;5(1):7-11*

Corresponding Author:
Esra Nur Akgül, Afyonkarahisar Health Sciences University, Faculty of Dentistry, Department of Pediatric Dentistry, Afyonkarahisar, Turkey
E-Mail: nurakgul1996@gmail.com

INTRODUCTION

The periodontium consists of the gingiva, cementum, periodontal ligament and alveolar bone surrounding and supporting teeth. The primary role of the periodontium is to provide functional requirements and maintain teeth in the mouth (1). The primary etiology of periodontal disease is microbial dental plaque. Systemic diseases and conditions that affect the body's response to plaque accumulation have also an impact on the progression of periodontal disease. Clinicians not only treat the periodontium with periodontal treatment but also control many systemic components caused by this disease. Although the leading cause of periodontal disease is microbial dental plaque, pregnancy is also a compelling factor in the etiology of periodontal disease (2).

The female body has developed an adaptation mechanism for all the changes from the first day of pregnancy to the moment of birth. Many hormonal and physiological changes are caused by the adaptations that pregnant woman develop to protect the fetus. However, these adaptive mechanisms sometimes cause complications (3).

Elevated progesterone levels up to 32 weeks of pregnancy trigger mucosal inflammation by decreasing the saliva flow rate and causing edema in the gums. Elevated estrogen levels cause gingival hyperplasia and inflammation. One of these negative changes is pregnancy gingivitis, which is commonly observed. Pregnancy gingivitis is observed in 30% to 100% of pregnancies and is characterized by erythema, edema, hyperplasia, and increased bleeding (2). Pregnancy gingivitis typically begins in the second month of pregnancy and reaches its peak in the eighth month. It resolves spontaneously after delivery (4).

Improving oral hygiene levels should be a priority for pregnancy-related oral complications. Oral hygiene education against gingivitis has been recommended for these patients. In severe cases, professional cleaning and chlorhexidine-containing mouthwashes should be used (5). The poor oral and dental health of the expectant mother during pregnancy adversely affects the duration and outcome of pregnancy, as well as the oral and dental health of the baby (6). Adverse pregnancy outcomes include preterm birth, low birth weight, miscarriage, and preeclampsia (7).

In light of this information, pregnant individuals should have sufficient knowledge about periodontal diseases and the effects of these diseases on the general health and pregnancy processes. In this respect, it would be beneficial for pregnant individuals to be informed about the causes and prevention of periodontal diseases and how they may affect pregnancy. Verbal education methods are commonly used in the field of health. Healthcare professionals make suggestions to their patients verbally in most cases. The main advantage of the verbal method, used almost every day in all areas of health care, is that it is free of charge. However, there are concerns about the distraction of the listener and the permanence of the information provided by verbal methods (8).

There are a limited number of studies on the education of pregnant women in Turkey. A significant limitation is that only the current knowledge level of pregnant women was determined in most published studies. This study aimed to evaluate the time-dependent effect of verbal and practical oral health education provided by dentists on pregnant individuals with the help of clinical periodontal parameters. Adequate oral health knowledge among expectant mothers and women who have recently given birth can make positive contributions to oral health.

MATERIALS AND METHODS

This study was approved by the Ankara University Faculty of Dentistry Clinical Research Ethics Committee (Date and Number: 25.02.2019-36290600/10). The randomized cross-sectional clinical study group consisted of 54 pregnant women living in Afyonkarahisar Province between six and 22 weeks of pregnancy (Table 1). The reason for paying attention to pregnant individuals between six and 22 weeks of pregnancy was that pregnant women were followed up for three months during the study. The clinical follow-up of mothers who have given birth after delivery is difficult.

Table 1. Mean age and educational status percentages of pregnant women

Characteristics of patients		
Number of patients		54
Age		18-39 (27.51±5.29)
Education status	Primary school	16.66%
	Middle school	33.33%
	High school	29.62%
	University	20.37%

Between April 2019 and March 2020, individuals whose pregnancy follow-ups were performed by family physicians at the health center were referred to the Department of Periodontology for clinical control. After giving their informed consent, the pregnant women were provided with oral hygiene education verbally and using the toothbrushing model. The modified Bass tooth brushing technique, flossing, and the use of an interdental brush of appropriate size in the presence of diastema or interdental space were explained to the patients and these were used for three months.

The study excluded smokers, people with diabetes, patients receiving regular medical treatment, and patients with any systemic disease. Patients with fixed, removable or implant prostheses were also excluded from the study. The study included individuals with a maximum of three missing teeth in the mouth.

Clinical Periodontal Measurements

After education, the probing pocket depth (PPD), plaque index (PI) and gingival index (GI) were measured using a 0.5 mm diameter Williams probe at six sites [mesio-buccal, mid-buccal, disto-buccal, disto-lingual (or disto-palatinal), mid-lingual (or palatinal), or mesio-lingual (or mesio-palatinal)] of each tooth in the mouth. Measurements were taken at baseline at the beginning of the study and repeated after one and three months. The mean score of the collected data was calculated by dividing the sum of the values given to each tooth measured by the product of the number of teeth present and the number of tooth surfaces measured (Table 2).

Table 2. Comparison of the means and SDs of clinical parameters (PPD, PI, GI) according to time

		Mean	Standard deviation	Standard error of the mean	Sig.
PPD	Baseline	2.3176	0.47671	0.06487	<0.001*
	First month	1.7859	0.55129	0.07502	
	Baseline	2.3176	0.47671	0.06487	<0.001*
	Third month	2.2607	0.59035	0.08034	
PI	Baseline	1.2511	0.36801	0.05008	<0.001*
	First month	0.8489	0.44265	0.06024	
	Baseline	1.2511	0.36801	0.05008	<0.001*
	Third month	1.3207	0.46220	0.06290	
GI	Baseline	1.3335	0.24188	0.03292	0.309
	First month	0.9137	0.40737	0.05544	
	Baseline	1.3335	0.24188	0.03292	<0.001*
	Third month	1.3978	0.27025	0.03678	

**Paired sample t test; p<0.05 denotes a significant difference*

PPD: probing pocket depth, PI: plaque index, GI: gingival index

Statistical Analysis

The Statistical Package for Social Science, IBM SPSS®, version 26, Chicago, USA (SPSS) software was used for statistical analysis to evaluate the results of the study. A $p<0.05$ was considered statistically significant. All data were analyzed using the dependent t test.

RESULTS

Although 96 pregnant women participated in the study, 54 (56.25%) pregnant women completed the study. The study was completed with 54 pregnant women aged 18-39 years with a mean and standard deviation (SD) of 27.51±5.29 years. There was no significant difference between the individuals in terms of the mean plaque index (PI), probing pocket depth (PPD) or gingival index (GI) at baseline ($p<0.05$). Sixteen percent of the pregnant women were primary school graduates, 33.33% were middle school graduates, 29.62% were high school graduates, and 20.37% were university graduates. (Table 1)

At the end of one month, there was a significant decrease in the probing pocket depth (PPD) and plaque index (PI) ($p<0.05$). While there was a decrease in the gingival index (GI), it was not significant. At the end of the third month, there was a significant decrease ($p<0.05$) in the PPD. There was a significant increase in the PI and GI ($p<0.05$). (Table 2)

DISCUSSION

The relationship between periodontal health status and pregnancy has been an important research topic since the 1960s (9). Gingival inflammation during pregnancy starts with dental plaque and becomes more severe with the addition of endogenous steroid hormones (10). Although the amount of plaque does not change during pregnancy, GI values peak in the third trimester and significantly decrease three months after delivery (11). Numerous studies have reported that periodontal disease can cause serious pregnancy complications, such as premature birth, low birth weight, and preeclampsia. Considering that periodontal disease can be prevented through good oral care, oral hygiene education and motivation can provide significant protection against

the risk of serious complications such as birth, low birth weight, and preeclampsia that may be observed during pregnancy (12,13).

In our study, at the end of the three-month follow-up period, similar increases in gingival indices were observed between 4.5 and 8 months of pregnancy. In another study, the gingival index and the formation of 4 mm or more deep pockets, which increase in a nonproportional manner with the amount of plaque, started to regress after the first two trimesters (14).

In our study, the significant decreases in the PPD and PI values of pregnant individuals over a one-month period may be attributed to the oral hygiene education they received at the beginning of the study. However, the decrease in GI values was not significant ($p<0.309$) during this one-month period, which may be associated with the change in hormonal balance and increased gingival inflammation during pregnancy. It seems contradictory that there was a significant decrease in PPD and PI but no decrease in GI at the end of the first month. However, this was interpreted as the PI decreasing with the development of the patients' oral hygiene habits. A decrease in the PPD was observed with the decrease in gingival edema, but with no significant decrease in the GI due to hormonal changes. The overall evaluation of the PPD, PI and GI parameters revealed that there was a significant ($p<0.05$) decrease in these parameters after one month. However, at the end of 3 months, the parameters returned to the initial level and even increased. This may occur as a result of hormonal changes during pregnancy (15).

Changes in estrogen and progesterone levels during pregnancy also alter the subgingival microflora. The prevalence of several periodontal pathogens, such as *Prevotella intermedia, Bacteroides* species and *Camplobacter rectus*, increases during pregnancy. An increase in the abundance of these pathogens and interaction between the periodontal microflora and the host also increase susceptibility to periodontal damage. Machado et al. (2012) reported that bacteria in the mouth may cause localized inflammation and adverse pregnancy outcomes through transfer to the uterus, regardless of the presence of clinical periodontitis (16).

Due to the hormonal changes during pregnancy and the increase in gingival inflammation, there was no significant decrease in periodontal parameters at the end of the three months. These values decreased further compared to the initial values. The small sample size of pregnant women included in the study can be considered a limitation of the study. The fact that the periodontal parameters decreased one month after the commencement of the study and returned to the baseline level or even increased further in the third month revealed that the oral hygiene education provided initially was effective for a temporary period. However, the patients subsequently returned to their old habits. Oral hygiene education and motivation to be given to pregnant individuals can provide significant benefits in preventing serious complication risks, such as preterm birth, low birth weight and preeclampsia that may be observed during pregnancy.

In light of these findings, the oral hygiene habits and periodontal health status of patients should be evaluated before pregnancy, oral hygiene should reach the optimum level, and the habit of maintaining oral hygiene should be acquired before pregnancy. We believe that in future studies regarding this subject, it would be more beneficial to provide video information to pregnant women in addition to both verbal and model training. It can also be beneficial to send reminder messages at regular intervals and to have dentist check-ups on the days of gynecologist appointments to follow up more frequently on the oral hygiene of pregnant women.

Declarations

The authors received no financial support for the research and/or authorship of this article. There are no conflicts of interest. This study was approved by the clinical research ethics committee of the Ankara University Faculty of Dentistry (Date: 25.02.2019, Number: 36290600/10).

REFERENCES

1. Kinane DF, Attstrom R. Advances in the pathogenesis of periodontitiss. Group B consensus report of the fifth European workshop in periodontology. J Clin Periodontol. 2005; 32: 130-131.
2. Singh T, Newman AB. Inflammatory markers in population studies of aging. Aging Res Rev. 2011; 10: 319-329.
3. Mascarenhas P, Gapski R, Al-Shammari K, Wang H-L. Influence of sex hormones on the periodontium. J Clin Periodontol. 2003; 30: 671-681.
4. Carrillo-de-Albornoz A, Figuero E, Herrera D, Bascones-Martínez A. Gingival changes during pregnancy: II. Influence of hormonal variations on the subgingival biofilm. J Clin Periodontol. 2010; 37: 230-240.
5. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. Am Fam Physician. 2008; 77: 1139-1144.

6. Khurshid Z, Naseem M, Sheikh Z, Najeeb S, Shahab S, Zafar MS. Oral antimicrobial peptides: Types and role in the oral cavity. Saudi Pharm J. 2016;24(5):515-524.
7. Figuero E, Han YW, Furuichi Y. Periodontal diseases and adverse pregnancy outcomes: Mechanisms. Periodontol 2000. 2020;83(1):175-188.
8. Amini K, Alihossaini Z, Ghahremani Z. Randomized Clinical Trial Comparison of the Effect of Verbal Education and Education Booklet on Preoperative Anxiety. J PeriAnesthesia Nurs. 2019; 34: 289-296.
9. Löe H, Silness J. Periodontal Disease in Pregnancy I. Prevalence and Severity. Acta Odontol Scand. 1963; 21: 533-551.
10. Saadaoui M, Singh P, Al Khodor S. Oral microbiome and pregnancy: A bidirectional relationship. J Reprod Immunol. 2021; 145:103293.
11. Tilakaratne A, Soory M, Ranasinghe AW, Corea SM, Ekanayake SL, de Silva M. Effects of hormonal contraceptives on the periodontium, in a population of rural Sri-Lankan women. J Clin Periodontol. 2000; 27: 53-757.
12. Nannan M, Xiaoping L, Ying J. Periodontal disease in pregnancy and adverse pregnancy outcomes: Progress in related mechanisms and management strategies. Front Med (Lausanne). 2022; 9:963956.
13. Uwambaye P, Munyanshongore C, Rulisa S, Shiau H, Nuhu A, Kerr MS. Assessing the association between periodontitis and premature birth: a case–control study. BMC Pregnancy Childbirth. 2021;21(1):204.
14. Gürsoy M, Pajukanta R, Sorsa T, Könönen E. Clinical changes in periodontium during pregnancy and postpartum. J Clin Periodontol. 2008; 35: 576-583.
15. Wu M, Chen SW, Jiang SY. Relationship between gingival inflammation and pregnancy. Mediators Inflamm. 2015; 2015:623427.
16. Machado IN, Martinez SD, Barini R. Anencephaly: do the pregnancy and maternal characteristics impact the pregnancy outcome? ISRN Obstet Gynecol. 2012; 2012: 127490.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):12-20

Received: 29 October 2023
Revised: 19 January 2024
Acccepted: 24 January 2024
DOI: 10.47482/acmr.1382922

ORIGINAL ARTICLE

The relationship between smartphone addiction and fear of missing out: phubbing as the mediator in students at a university's faculties

Edibe Pirinçci[1] **Fatma Nur Karaçorlu**[2] **Mehmet Onur Kaya**[3]

1 Fırat University, Faculty of Medicine, Department of Public Health, Elazığ, Turkey
2 Muş Bulanık District Health Directorate, Muş, Turkey
3 Fırat University, Faculty of Medicine, Department of Biostatistics, Elazığ, Turkey

Abstract

Background: Smartphone addiction is a public health problem. The aim of this study was to investigate the relationship between smartphone addiction with fear of missing out and phubbing.

Methods: The universe of this cross-sectional study consisted of all students studying at Fırat University Faculties. 582 students were reached. A questionnaire was used as data collection tools. The questionnaire consists of demographic information form, questions about smartphone use, Smartphone Addiction Scale-Short Version, Fear of Missing Out Scale, and Phubbing Scale. SPSS PROCESS macro version 3.5 (Model 4) was used to test the mediation effect.

Results: 51.5% of the students were women and the mean age of all students was 22.06 ± 2.99. Smartphone addiction score was higher in women ($p < 0.05$). A significant negative correlation was found between smartphone addiction and age ($r = -0.10$). A significant positive correlation was found between smartphone addiction and daily smartphone usage frequency ($r = 0.31$) and daily smartphone usage duration ($r = 0.44$). Fear of missing out and phubbing were significant positive predictors of smartphone addiction. Phubbing had a mediating effect on the effect of fear of missing out on smartphone addiction.

Conclusion: Phubbing as a mediator increases the impact of fear of missing out on smartphone addiction.

Keywords: Smartphone, Addiction, Phubbing, Fear of Missing Out, University Student.

Cite this article as: *Pirinçci E, Karaçorlu F N, Kaya M O. The relationship between smartphone addiction and fear of missing out: phubbing as the mediator in students at a university's faculties. Arch Curr Med Res. 2024;5(1):12-20*

Corresponding Author:
Fatma Nur Karaçorlu, Muş Bulanık District Health Directorate, Muş, Turkey
E-Mail: fatmanurkaracorlu@hotmail.com

INTRODUCTION

The number of smartphone users worldwide has exceeded six billion and is expected to increase several hundred million over the next few years (1). The smartphone usage frequency is expected to increase to 73.71% by 2024 in Turkey (2). Despite the advantages of using smartphones, many people overuse their phones in a way that interfere with their daily lives (3). According to the data of Statista 2017 time spent on daily smartphone usage worldwide, almost half of the participants spent five hours or more on their smartphones daily (4). Excessive and problematic use of the smartphone is associated with smartphone addiction (5). Smartphone addiction is a public health problem that affects a significant and increasing number of people (6). Especially young people are more likely to accept new technologies than older generations; and thus, young people are more prone to smartphone addiction compared to adults (7).

The fear of missing out (FoMO) is defined as the person's serious anxiety that others may have satisfactory experiences while he / she is absent. FoMO is characterized by the desire to be constantly aware of what others are doing (8). Fear of missing out encourages people to use social media tools and people who experience this fear use their smartphones to meet their need to stay connected (9), because smartphones are the most frequently used device in the world to access social media accounts, and 78% of people access their social media accounts only from their smartphones (10). More than half of the students participating in a study conducted among university students in Turkey used their social media accounts for 3 hours and more daily via their smartphones (11). The fear of missing out with excessive use of smartphones was an important predictor of smartphone addiction (9).

Phubbing is defined as a situation where an individual looks at their smartphone during a conversation with other people, dealing with the smartphone, and avoiding interpersonal communication (12). This situation may also be related to the increased availability of virtual social environments (13). FOMO forces people to check their smartphones repeatedly to avoid missing something on social media (14). In order to cope with this anxiety, individuals may use their smartphones even when they are physically with others and thus do phubbing behavior (15). Therefore, FOMO is a significant predictor of phubbing (16).

Phubbing is one of the behavior associated with the widespread availability of smartphones (12). In addition, phubbing behavior can be seen everywhere in today's modern society and has now become an accepted norm (17). People with FOMO can use their smartphones as often as they want without hesitation in any environment, thanks to the fact that phubbing behavior is a norm, in order to eliminate these concerns, and this may cause smartphone addiction (17). There are studies in the literature showing a positive and significant relationship between phubbing and smartphone addiction (18, 19).

In conclusion, it is important to investigate possible predictors that may increase smartphone addiction, since smartphone addiction is a public health problem and is more common in young people. Although previous research has identified some predictive factors for smartphone addiction, there is little research investigating the link between fear of missing out and smartphone addiction, and understanding of factors that may help explain this relationship is limited. Therefore, this study aimed to investigate the factors related to smartphone addiction. Mainly, the aim of the study was to examine whether fear of missing out behavior could significantly predict smartphone addiction of university students and to investigate whether phubbing behavior could significantly mediate this relationship. The secondary aim of the study was to examine the characteristics of phubbing and exposure to phubbing. Based on the literature review, we proposed the following hypotheses (Figure 1):

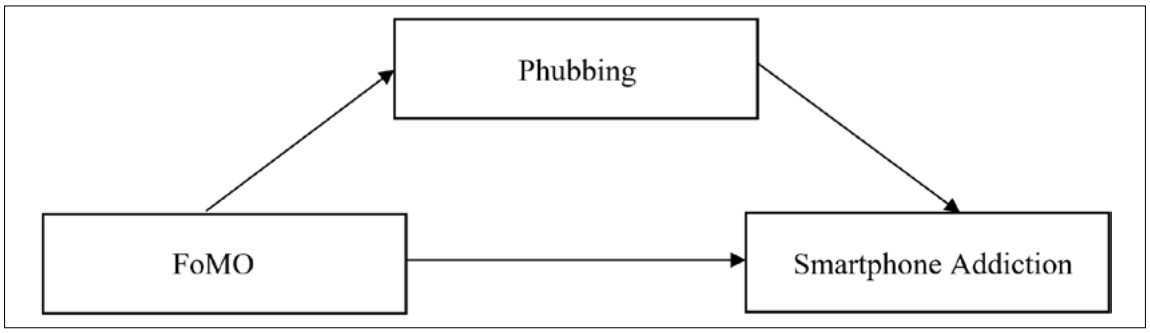


Figure 1. Mediation model

Hypothesis 1. Fear of missing out positively and significantly predicts smartphone addiction.

Hypothesis 2. Fear of missing out positively and significantly predicts phubbing behavior.

Hypothesis 3. Phubbing positively and significantly predicts smartphone addiction.

Hypothesis 4. Phubbing mediates the relationship between fear of missing out and smartphone addiction.

MATERIALS AND METHODS

The universe of this cross-sectional study consisted of all students studying at Fırat University Faculties in the 2018-2019 academic year. There were a total of 16 faculties at Fırat University and 29,635 students studying at these faculties. When the power analysis was performed by taking the significance level of 0.05, the power of 80%, and the correlation coefficient between the two independent variables approximately 0.12 after deducting the margin of error, it was calculated that the sample size should be at least 540 and maximum 600. The number of students to be included in the research from each faculty was weighted and calculated according to the total number of students of each faculty, and students were selected by simple random sampling method in each faculty. Data collection was carried out between April and May 2019. The application of the survey was completed after the necessary explanations were made and informed consent was obtained. As a result, 582 students were reached.

A questionnaire was used as a data collection tool. The questionnaire was applied under direct observation. The questionnaire consisted of four parts. There were demographic information form and questions about smartphone use in the first part, Smartphone Addiction Scale - Short Version in the second part, Fear of Missing Out Scale in the third part, and Phubbing Scale in the fourth part.

1) Smartphone Addiction Scale - Short Version (SAS-SV): It is a six-point Likert-type personal rating scale developed by Kwon et al. (2013) to measure the risk of smartphone addiction in adolescents (7). Scale items are scored from 1 to 6. Scale scores range from 10-60. The increase in the score obtained from the scale means that the risk of addiction increases. The scale has one factor and does not have subscales. The Cronbach alpha coefficient of the original scale was 0.91. The validity and reliability study of the Turkish version of the scale was performed by Noyan et al. (2015) in university students and Cronbach alpha coefficient was 0.86 (20).

2) Fear of Missing Out Scale (FoMO): It is a personal rating scale developed by Przybylski et al. (2013) in participants between 18 and 62 years old, and adapted to Turkish by Gökler et al. (2016) in university students (8, 21). A 5-point Likert scale (1 = Not at all true of me; 5 = Extremely true of me) is used on the scale, which contains 10 items and has a one-dimensional structure. The score that can be obtained from the scale varies between 10-50. As the score obtained from the scale increases, the level of fear of missing out the increases. It was reported that the Cronbach Alpha coefficient ranged from 0.87 to 0.90 for the original scale, and calculated as 0.81 for the Turkish version.

3) Phubbing Scale (PS): The scale developed by Karadag et al. (2015) in university students in Turkey is a Likert-type personal rating scale that evaluates the situation of the person not participating in the chat environment and dealing with his/her smartphone (12). The scale consists of 10 items and 2 sub-dimensions including (i) Communication Disturbances (5 items, α = 0.87) and (ii)

Phone Obsession (5 items $\alpha = 0.85$). Participants evaluate each item on a 5-point Likert scale ranging from 1 for never to 5 for always. The increase in the score obtained from the scale indicates that the level of phubbing increases.

The data obtained in the study were recorded and analyzed using the IBM SPSS for Windows version 21.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics according to the characteristics of the variables were presented as frequency and percentage for categorical variables, and as mean ± standard deviation or median (with 1st Quarter (Q1) and 3rd Quarter (Q3)) for continuous variables. The conformity of the continuous variables to the assumption of normal distribution was evaluated with the Shapiro Wilk test. It was found that all continuous variables in the study (age, frequency of daily smartphone use, duration of daily smartphone use, years of smartphone use, number of social media accounts used, SAS-SV score, FoMO scale score and Phubbing scale score) did not show normal distribution. To compare continuous variables, the Mann-Whitney U test was used for two independent groups and the Kruskal Wallis H test was used for more than two independent groups. The Spearman correlation coefficient method was used to determine the relationship between two independent variables with a continuous measurement level. It was assumed that phubbing mediated the relationship between FoMO and smartphone addiction. SPSS PROCESS macro version 3.5 (Model 4) was used to test the mediation effect (22). In the model, the FoMO score was the predictor, the PS score was the mediator, and the SAS-SV score was the outcome variable. The indirect effect was estimated for 5000 bootstrap samples with a 95% bias-corrected confidence interval. Confidence intervals that do not include zero indicate effects that are significant. Statistical significance was evaluated as $p < 0.05$.

Ethical permission for the research was obtained from the Fırat University Non-Interventional Research Ethics Committee. The meeting date was 11.04.2019, the meeting number was 06, the decision number was 12. Institutional permission was obtained from the Rectorate of Fırat University.

RESULTS

51.5% of the students included in the study were female, 48.5% were male. The mean age of all students was 22.07 ± 3.00 (min = 18, max = 50) and the median value of age was 22.00 (21.00-23.00).

The median frequency of students using smartphones daily was 20.00 (10.00-40.00) times, the median duration of using smartphones daily was 4.00 (2.50-6.00) hours, the median time of owning a smartphone was 6.00 (4.42-8.00) years. The median values of the scores that the students received from the scales were as follows: 28.00 (21.00-36.00) for SAS-SV, 24.00 (18.00-29.00) for FoMO, 25.00 (20.00-31.00) for PS.

Comparison of SAS-SV, FoMO and PS scores according to the gender of the participants is shown in Table 1. SAS-SV ($p < 0.001$) and PS ($p = 0.017$) scores were higher in women.

Table 1. Comparison of Smartphone Addiction Scale - Short Version, Fear of Missing Out Scale and Phubbing Scale scores according to the gender of the participants

Variables	Smartphone Addiction Scale - Short Version		Fear of Missing Out Scale		Phubbing Scale	
	Median (Q1-Q3)	p	Median (Q1-Q3)	p	Median (Q1-Q3)	p
Gender						
Male	25.0 (19.5-35.0)	<0.001	24.0 (18.0-30.0)	0.067	24.0 (19.0-30.0)	0.017
Female	31.0 (22.0-38.0)		22.0 (18.0-28.0)		25.0 (21.0-31.0)	

The relationship coefficients between continuous variables are given in table 2. A significant negative correlation was found between smartphone addiction and age ($r = -0.10$). A significant positive correlation was found between smartphone addiction and daily smartphone usage frequency ($r = 0.31$), daily smartphone usage duration ($r = 0.44$), number of owned social media accounts ($r = 0.21$), FoMO ($r = 0.43$) and PS ($r = 0.71$) scores ($p < 0.05$). There was a significantly positive correlation between FoMO and PS scores ($r = 0.49$, $p < 0.001$).

Table 2. Spearman correlation coefficients among study variables

Variables	1	2	3	4	5	6	7	8
1.SAS-SV	1							
2.Age	-0.10*	1						
3.Daily usage frequency	0.31***	-0.06	1					
4.Daily usage duration	0.44***	-0.13**	0.35***	1				
5.Years of usage	0.03	0.16***	0.06	0.03	1			
6.Social media	0.21***	-0.06	0.22***	0.28***	0.08*	1		
7.FoMO	0.43***	-0.11**	0.22***	0.27***	0.04	0.24***	1	
8.Phubbing Scale	0.71***	-0.13**	0.31***	0.47***	0.04	0.24***	0.49***	1

*Note: The numbers in the variables row represent the same number of variables in the variables column. SAS-SV = Smartphone Addiction Scale - Short Version score, Daily usage frequency = The daily smartphone usage frequency, Daily usage duration = The daily smartphone usage hours, Years of usage = Years of using smartphone, Social media = Number of social media accounts used, FoMO = Fear of Missing Out Scale score, Phubbing Scale = Phubbing Scale score, *p < 0.05, **p < 0.01, ***p < 0.001.*

The results of the mediation analysis are shown in Table 3. FoMO score positively predicts PS score (β = 0.48, p <0.001) and PS score positively predicts SAS-SV score (β = 0.65, p <0.001). FoMO score and PS score together explain 51% of the change in the SAS-SV score. Phubbing has a mediating effect on the relationship between FoMO and smartphone addiction. The direct effect of the FoMO score on the SAS-SV score is β = 0.11 (p = 0.003), the indirect effect is β = 0.31 (95% CI = 0.25-0.38) and the total effect is β = 0.42 (p<0.001).

Table 3. The mediating effect of phubbing on the relationship between FoMO and smartphone addiction

Predictors	Phubbing Scale		SAS-SV		SAS-SV	
	β	p	β	p	β	p
FoMO	0.48	<0.001	0.11 (direct)	0.003	0.42 (total)	<0.001
Phubbing Scale			0.65	<0.001		
Model R^2	0.23		0.51		0.18	
Model p value	<0.001		<0.001		<0.001	

Note: SAS-SV = Smartphone Addiction Scale - Short Version score, FoMO = Fear of Missing Out Scale score, Phubbing Scale = Phubbing Scale score.

88.8% of the students reported using their phone while communicating face-to-face with someone, and 97.8% reported that they were exposed to phubbing. 94.1% stated that phubbing was not an appropriate behavior and 93.1% stated that phubbing was not seen as appropriate by the society (Table 4).

Table 4. The distribution of the characteristics of phubbing and exposure to phubbing

Variables	n	%
Using the phone while communicating face to face with someone (n = 582)		
Always	12	2.0
Often	35	6.0
Sometimes	178	30.6
Rarely	292	50.2
Never	65	11.2
Phone usage of the other person while communicating face to face (n = 581)		
Always	21	3.6
Often	191	32.9
Sometimes	259	44.6
Rarely	97	16.7
Never	13	2.2
Using a phone while communicating with someone face to face is a suitable behavior (n = 580)		
No	546	94.1
Yes	34	5.9
Using a phone while communicating with someone face to face is seen as an appropriate behavior by others (n = 582)		
No	542	93.1
Yes	40	6.9

DISCUSSION

Little research has investigated the relationship between fear of missing out and smartphone addiction, and the mediating mechanisms underlying this relationship remain largely unknown. The present study investigated the predictive role of fear of missing out to university students' smartphone addiction, and the mediating role of phubbing in this relationship. The results showed that fear of missing positively predicted university students' smartphone addiction, and this relationship was mediated by phubbing.

The median of SAS-SV score was found to be 28.00 (21.00-36.00) in the present study. Similar results were found in another study conducted in Turkey (23) and in studies conducted in The United States of America (24), Japan (25) and United Kingdom (17). In different parts of the world, SAS-SV score has been approximately the same; the use of smartphones has become globalized in the 21st century.

SAS-SV score was significantly higher in women than in men in the present study. It is thought that this situation may be related to the fact that female students maintain their communication and social relations on smartphones, while male students use their smartphones for different purposes such as watching videos and playing games (26, 27). Playability in games that require the use of additional function keys in a coordinated manner is less in smartphones, due to the limited control keys, hardware and screen size compared to computers. This may cause men to be more likely to spend time with devices other than smartphones.

As age decreased, SAS-SV score increased. In the literature, there are studies that found a negative relationship between age and SAS-SV score (28-32).

The median value of the daily smartphone usage duration of the students was found to be 4.00 hours. Assuming that a college student sleeps an average of 8 hours a day, one quarter (4 hours) of the 16 hours they are awake per day is spent using a smartphone and this indicates to overuse. Additionally, there was a significant positive relationship between the SAS-SV score with the daily smartphone usage frequency and duration. In the literature, there are studies that found significant positive relationships between SAS-SV score and daily smartphone check frequency (20, 24, 28) and daily duration of use (20, 33). These findings can be explained by the fact that tolerance in addicts causes increased usage.

There was a positive relationship between the number of social media accounts owned and SAS-SV, FoMO and PS scores in the present study. Similarly, in another study conducted in Spain, it was found that there was a positive relationship between FoMO score and the number of social media accounts owned (34). As the level of fear of missing out the developments on social media increases, people may have more social media accounts and try to overcome their fear and curiosity through these accounts.

According to the model we created in the study, it was seen that FoMO score was found to be a positive and significant predictor of SAS-SV score in the model (Hypothesis 1). This finding is consistent with the literature (9, 17, 35). People who are afraid of missing developments on social media increase their smartphone use, which is an act of fear. As fear levels increase, smartphone usage duration will increase, as smartphone usage duration increases, addiction will develop. In the model, it was determined that fear of missing out was the predictor of phubbing, and hypothesis 2 was confirmed. Other studies in the literature support this finding (36-39). The urge of the individual to check the phone in order not to miss something online causes them to use their phones even when they are physically with others (17, 40). Also, phubbing was not only a consequence of fear of missing out, but also a predictor of smartphone addiction (Hypothesis 3). Although past studies indicate that smartphone addiction is a predictor of phubbing (12, 39), since phubbing is now a norm (41), people can use their smartphones unlimitedly in any environment they want, which can lead to smartphone addiction by facilitating excessive phone use. In addition, consistent with our assumption (Hypothesis 4), phubbing was found to mediate the relationship between fear of missing out and smartphone addiction in university students. The fact that phubbing is now a norm contributes to people who have anxiety due to FoMO to use their smartphones in any environment they want without hesitation.

The fact that 94.1% of the participants in the present study did not consider phubbing behavior appropriate and 93.1% thought that phubbing behavior was not approved by the society, reveals their awareness on this issue. However, it was found that the majority of students (88.8%) practiced phubbing behavior, which shows that their awareness and behavior do not match. Similarly, in a study conducted in a college in Denmark, it was stated that although phubbing behavior is characterized by young people as disrespectful and a behavior that makes the other person feel worthless, they do this behavior (42). In addition, the fact that 97.8% of the participants in this study stated that they were exposed to phubbing behavior shows that this problem is quite common. These high prevalences are becoming more important because of reducing the quality of interpersonal face-to-face interactions. Phubbing behavior by ignoring the other person through a smartphone may cause them to respond to this behavior intentionally or unintentionally. With the repetition of phubbing behavior in response, phubbing is perceived as normative or acceptable (17).

The current study has its limitations. Firstly, the findings of this study are limited to all students studying in faculties at Fırat University. Therefore, the findings cannot be generalized to students at different universities. In future studies, re-examining the subject in different populations will be useful for further clarification of the subject. Secondly, the cross-sectional design of the present study prevents us from making causal inferences. Further studies are needed to find causal relationships between variables. In addition, since smartphone addiction is not yet included in the Diagnostic and Statistical Manual of Mental Disorders-5, a clinical diagnosis of smartphone addiction cannot be made (43), and the scale used in the study is a self-assessment scale and only determines the behavioral characteristics of individuals. Finally, learning about students' smartphone usage characteristics (such as daily smartphone usage time and frequency) through a self-reported questionnaire may cause the result to be underestimated.

This study also has some strengths. As this study covers all faculties of Fırat University, having a wide range of students studying in different fields is a strong aspect of this study. In addition, this study shows that phubbing behavior is a factor that explains how FoMO behavior contributes to smartphone addiction.

As a result, smartphone addiction was found to be more common in women. There was a positive and significant relationship between smartphone addiction and age, daily smartphone checking frequency and duration, number of social media accounts owned, fear of missing out, and phubbing. Fear of missing out and phubbing were significant positive predictors of smartphone addiction. In addition, phubbing had a mediating effect on the effect of fear of missing out on smartphone addiction. In order to better understand and reduce smartphone addiction, it may be necessary to investigate what causes the fear of missing out. Thus, interventions can be made for these reasons. In addition, since it has been determined that an interpersonal communication problem such as phubbing causes smartphone addiction, a solution to smartphone addiction can be found by investigating other communication problems and their causes, especially phubbing.

Declarations

The authors have no conflicts of interest to declare. The authors declared that this study has received no financial support.

Ethical permission for the research was obtained from the Fırat University Non-Interventional Research Ethics Committee. The meeting date was 11.04.2019, the meeting number was 06, the decision number was 12. Institutional permission was obtained from the Rectorate of Fırat University.

REFERENCES

1. Statista. Number of smartphone mobile network subscriptions worldwide from 2016 to 2022, with forecasts from 2023 to 2028. Available at https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/ Accessed October 29, 2023
2. Statista. Forecast of the smartphone user penetration rate in Turkey from 2018 to 2024. Available at https://www.statista.com/statistics/568281/predicted-smartphone-user-penetration-rate-in-turkey/ Accessed October 29, 2023
3. Cheever NA, Rosen LD, Carrier LM, Chavez A. Out of sight is not out of mind: the impact of restricting wireless mobile device use on anxiety levels among low, moderate and high users. Comput Human Behav. 2014;37:290-7.
4. Statista. Time spent on smartphone everyday worldwide in 2017. Available at https://www.statista.com/statistics/781692/worldwide-daily-time-spent-on-smartphone/ Accessed October 29, 2023
5. Demirci K, Akgönül M, Akpinar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. J Behav Addict. 2015;4(2):85-92.
6. Van Velthoven MH, Powell J, Powell G. Problematic smartphone use: digital approaches to an emerging public health problem. Digit Health. 2018;4:205520761875916.
7. Kwon M, Kim D-J, Cho H, Yang S. The Smartphone Addiction Scale: development and validation of a short version for adolescents. PLOS ONE. 2014;8(12):e83558.
8. Przybylski AK, Murayama K, DeHaan CR, Gladwell V. Motivational, emotional, and behavioral correlates of fear of missing out. Comput Hum Behav. 2013;29(4):1841-8.
9. Elhai JD, Levine JC, Dvorak RD, Hall BJ. Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. Comput Hum Behav. 2016;63:509-16.
10. Dean B. Social network usage & growth statistics: how many people use social media in 2023? What's the percentage of social media usage on mobile vs. Desktop? Available at https://backlinko.com/social-media-users Accessed October 29, 2023
11. Gezgin D, Hamutoglu N, Gemikonakli O, Raman I. Social networks users: Fear of missing out in preservice teachers. J Educ Pract. 2017;18:156-68
12. Karadag E, Tosuntas SB, Erzen E, Duru P, Bostan N, Sahin BM, et al. Determinants of phubbing, which is the sum of many virtual addictions: a structural equation model. J Behav Addict. 2015;4(2):60-74.
13. Guazzini A, Duradoni M, Capelli A, Meringolo P. An explorative model to assess individuals' phubbing risk. Future Internet. 2019;11(1):21.
14. Butt AK, Arshad T. The relationship between basic psychological needs and phubbing: Fear of missing out as the mediator. PsyCh journal. 2021;10(6):916-25.
15. Tandon A, Dhir A, Talwar S, Kaur P, Mäntymäki M. Social media induced fear of missing out (FoMO) and phubbing: behavioural, relational and psychological outcomes. Technol Forecast Soc Change. 2022;174:121149.
16. Paul J. "I can't look at you while talking!" – fear of missing out and smartphone addiction as predictors of consumer's phubbing behavior. J Res Interact Mark. 2023.
17. Chotpitayasunondh V, Douglas KM. How "phubbing" becomes the norm: the antecedents and consequences of snubbing via smartphone. Comput Hum Behav. 2016;63:9-18.
18. Safdar Bajwa R, Abdullah H, Zaremohzzabieh Z, Wan Jaafar WM, Abu Samah A. Smartphone addiction and phubbing behavior among university students: a moderated mediation model by fear of missing out, social comparison, and loneliness. Front Psychol. 2022;13:1072551.
19. Talan T, Doğan Y, Kalinkara Y. Effects of Smartphone addiction, social media addiction and fear of missing out on university students' phubbing: a structural equation model. Deviant Behav. 2023:1-14.
20. Noyan CO, Enez Darçın A, Nurmedov S, Yilmaz O, Dilbaz N. Akıllı Telefon Bağımlılığı Ölçeğinin kısa formunun üniversite öğrencilerinde Türkçe geçerlilik ve güvenilirlik çalışması. Anadolu Psikiyatri Derg. 2015;16:73-81.
21. Gökler ME, Aydin R, Ünal E, Metintaş S. Sosyal ortamlarda gelişmeleri kaçırma korkusu ölçeğinin Türkçe sürümünün geçerlilik ve güvenilirliğinin değerlendirilmesi. Anadolu Psikiyatri Derg. 2016;17:53-9.
22. Hayes AF. Introduction to mediation, moderation, and conditional process analysis. New York: Guilford Press; 2013.

23. Konan N, Durmuş, E, Türkoğlu, D, Ağıroğlu, Bakır, A. How is smartphone addiction related to interaction anxiety of prospective teachers? Educ Sci. 2018;8:186.
24. Elhai JD, Tiamiyu M, Weeks J. Depression and social anxiety in relation to problematic smartphone use. Internet Res. 2018;28(2):315-32.
25. Tateno M, Kim DJ, Teo AR, Skokauskas N, Guerrero APS, Kato TA. Smartphone addiction in Japanese college students: usefulness of the Japanese version of the Smartphone Addiction Scale as a screening tool for a new form of internet addiction. Psychiatry Investig. 2019;16(2):115-20.
26. Akturk U, Budak F, Gultekin A, Ozdemir A. Comparison of smartphone addiction and loneliness in high school and university students. Perspect Psychiatr Care. 2018;54(4):564-70.
27. Sahin S, Ozdemir K, Unsal A, Temiz N. Evaluation of mobile phone addiction level and sleep quality in university students. Pak J Med Sci. 2013;29(4):913-8.
28. Elhai JD, Levine JC, O'Brien KD, Armour C. Distress tolerance and mindfulness mediate relations between depression and anxiety sensitivity with problematic smartphone use. Comput Hum Behav. 2018;84:477-84.
29. Elhai JD, Rozgonjuk D, Yildirim C, Alghraibeh AM, Alafnan AA. Worry and anger are associated with latent classes of problematic smartphone use severity among college students. J Affect Disord. 2019;246:209-16.
30. Lee EB. Too much information: heavy smartphone and facebook utilization by African American young adults. J Black Stud. 2014;46(1):44-61.
31. Tras Z, Oztemel K. Examining the relationships between facebook intensity, fear of missing out, and smartphone addiction. Addicta. 2019;6:91-113.
32. Wang H-Y, Sigerson L, Cheng C. Digital nativity and information technology addiction: age cohort versus individual difference approaches. Comput Hum Behav. 2019;90:1-9.
33. Cocoradă E, Maican CI, Cazan A-M, Maican MA. Assessing the smartphone addiction risk and its associations with personality traits among adolescents. Child Youth Serv Rev. 2018;93:345-54.
34. Fuster H, Chamarro A, Oberst U. Fear of missing out, online social networking and mobile phone addiction: a latent profile approach. Aloma. 2017;35(1):23-30.
35. Wolniewicz CA, Tiamiyu MF, Weeks JW, Elhai JD. Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. Psychiatry Res. 2018;262:618-23.
36. Balta S, Emirtekin E, Kircaburun K, Griffiths MD. Neuroticism, trait fear of missing out, and phubbing: the mediating role of state fear of missing out and problematic instagram use. Int J Ment Health Addict. 2018;18:628-39.
37. Blanca MJ, Bendayan R. Spanish version of the Phubbing Scale: internet addiction, facebook intrusion, and fear of missing out as correlates. Psicothema. 2018;30(4):449-54.
38. Fang J, Wang X, Wen Z, Zhou J. Fear of missing out and problematic social media use as mediators between emotional support from social media and phubbing behavior. Addict Behav. 2020;107:106430.
39. Franchina V, Vanden Abeele M, van Rooij AJ, Lo Coco G, De Marez L. Fear of missing out as a predictor of problematic social media use and phubbing behavior among Flemish adolescents. Int J Environ Res Public Health. 2018;15(10):2319.
40. Schneider FM, Hitzfeld S. I ought to put down that phone but ı phub nevertheless: examining the predictors of phubbing behavior. Soc Sci Comput Rev. 2021;39(6):1075-88.
41. Li Y-X, Zhang Y-H, Yang R, Lian S-L, Yan L, Zhu X-M. Relationship between perceived social norms and phubbing: individual control and fear of missing out as mediators. Int J Ment Health Addict. 2021.
42. Aagaard J. Digital akrasia: a qualitative study of phubbing. AI Soc. 2020;35(1):237-44.
43. Wu-Ouyang B. Are smartphones addictive? Examining the cognitive-behavior model of motivation, leisure boredom, extended self, and fear of missing out on possible smartphone addiction. Telemat Inform. 2022;71:101834.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):21-27

Received: 23 December 2023
Revised: 24 December 2023
Acccepted: 24 December 2023
DOI: 10.47482/acmr.1408884

ORIGINAL ARTICLE

Social media interaction of publications in the field of general surgery: A comparative analysis of the twitter performances of Q1 medical journals with their impact factor

Alparslan Ertenlice[1]

1 Gaziantep Nizip State Hospital, Department of General Surgery, Gaziantep, Turkey

Abstract

Background: It is a well-known fact that social media has the power to reach a great number of audiences through robust information, interaction, and communication. Twitter is also known to be one of the strongest social media tools, which is especially known for its high volume of information sharing. In this study it is aimed to analyse the relationship between the impact factor (IF) of Quartiles1(Q1) journals in the field of General Surgery and their performances on Twitter.

Methods: Surgical Q1 journals have been listed. While creating the list, journals without a Twitter account have been excluded from the study. The IF of the journals has been compared with their total shares, comments, likes, retweets, total views, followers, and total shares for all time between June 1st, 2023, and November 30th, 2023.

Results: Results indicated moderate positive correlations between IF and engagement metrics like shares, comments, likes, and retweets, with follower count and total shares showing stronger statistically significant correlation.

Conclusion: No comparative relationship or correlation is found between the parameters of the last six months and the IF. Only, a correlation has been observed with the total number of views within the last six months. A correlation is noted between the number of followers and the total number of shares for all time. These results are attributed to the fact that journals with a high IF are established and respected and lead to these outcomes even if they share at similar rates as other journals.

Keywords: General Surgery, Social Media, Impact Factor, Twitter.

Cite this article as: *Ertenlice A. Social media interaction of publications in the field of general surgery: A comparative analysis of the twitter performances of Q1 medical journals with their impact factor. Arch Curr Med Res. 2024;5(1):21-27*

Corresponding Author:
Alparslan Ertenlice, Department of General Surgery, Gaziantep Nizip State Hospital, Gaziantep, Turkey
E-Mail: ertenlice@gmail.com

INTRODUCTION

Today, the effect of academic publications has been evaluated and discussed not only by the scientific community but also by the wider public. An important platform that attracts the attention of these broader audiences is social media. Specifically, for the dissemination of any scientific information and the transfer of knowledge, the platform that stands out is Twitter, which was officially renamed as X, on July 24th, 2023.(1) By 2023, Twitter has approximately 528.3 million active monthly users worldwide. This number represents the total of users who regularly participate in and engage with the content on the platform. In Turkey, the number of Twitter users is reported to be approximately 18.55 million.(2)

The role of social media in the development of medical and surgical education, and the transmission of innovations and experiences has been increasingly gaining importance. Besides, its function for news and announcements, the interactions and shares on social media accounts have become a different indicator of impact factor today.(3)

The Journal Impact Factor (JIF) is a number calculated annually for each scientific journal, based on the average number of citations to articles published in the previous two years.(4) Quartile 1 (Q1) is a classification given by Journal Citation Reports (JCR), indicating that a scientific journal is in the top 25% in its field based on its impact factor. This classification demonstrates the importance and the prestige of a journal in its field, usually indicating journals that publish high-quality and influential researches.(5)

In this study, it is aimed to examine the relationship between the Twitter account metrics of medical journals in the Q1 category of the surgical field – such as follower counts, the number of shares, and the number of comments/replies, likes, retweets (RT), and views – and their impact factors. In the literature review, particularly in the field of general surgery, no study examining the social media usage of surgical Q1 journals has been found. This research is the first of its kind aiming to fill this gap by examining and comparing the social media activities of reputable general surgery journals. This study would help researchers to understand the strategies and the impact of Q1 journals in the field of general surgery better by exploring the relationship between their impact factor and social media usages.

MATERIALS AND METHODS

Ethics committee approval is not required since the data related to the study were obtained from the publicly available internet environment and human participants were not included in the study. Q1 scientific journals in the field of surgery have been listed on the Scimago Journal & Country Rank page.(6) Journals in general surgery, emergency surgery, burn unit, surgical intensive care, hepatobiliary surgery, colorectal surgery, breast-endocrine surgery, and upper gastrointestinal system surgery have been included in this study. Journals in the listed Q1 category with Twitter accounts have been identified and the IF of these identified journals have been listed and ranked. Various elements such as the total number of shares, comments/replies on the shares, retweets (RT), likes, and views between June 1st, 2023 and November 30th, 2023 (last six months) on their Twitter accounts have been detected. The journals that did not share anything within the last six months have been excluded from the study. Additionally, the number of the followers of the accounts and the total number of shares since the account was opened have also been included in the study. The data for the study are collected via Twitter analytics channels and by checking account shares. In line with the objectives of this study, only the profiles that are associated with journals have been included in the analysis. The accounts that are associated with communities are excluded.

Statistical analysis

In the statistical analysis, SPSS v. 25.0 software (SPSS Inc., Chicago, IL, USA) is used. The distributions of numerical variables are examined by using both visuals (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Descriptive statistics are presented as median, minimum-maximum (min-max) values due to the non-normal distribution of continuous variables. Because of the non-normal distribution of the data, the Spearman method is used in the correlation analysis, and the Spearman's correlation coefficient is calculated. Scatter plots are utilized to demonstrate the correlation between the impact factor and other data. A p-value of < 0.05 is considered to be statistically significant.

RESULTS

In this study, out of the 128 journals in the Q1 category, 24 journals related to the field of general surgery have been evaluated. Of these, 18 journals (14%) that had a Twitter account and made posts within the last 6 months have been included in the study. (Table 1)

Table 1. Journals included in the study and data related to their journal accounts

Journal	Twitter handle	IF	T.posts *p6m*	T.replying *p6m*	T.likes *p6m*	T.RT *p6m*	T. view *p6m*	Followers	Total posts
JAMA Surgery	@JAMASurgery	16.9	201	110	2957	6579	2022887	51617	16977
Annals of Surgery	@AnnalsofSurgery	10.1	7	5	89	165	74398	55460	9967
British Journal of Surgery (BJS)	@BJSurgery	9.6	906	7530	13590	28086	1194918	45537	16036
Liver Transplantation	@LTxJournal	5	114	840	342	798	106308	5461	2768
Journal of the American College of Surgeons	@acsJACS	5.2	156	1680	468	1248	535728	34149	8186
Surgery for Obesity and Related Diseases	@SOARD_ JOURNAL	3.1	48	528	384	672	47220	4525	1588
Surgery Journal	@SurgJournal	3.8	636	1836	5724	9540	432894	22782	11059
BJS open	@BjsOpen	3.2	510	4590	4590	7650	1053606	10139	1674
Annals of Surgical Oncology	@AnnSurgOncol	3.7	582	5796	2910	6402	940344	14287	5458
Obesity Surgery	@JournalObesity	2.9	48	510	336	480	44166	2066	297
Journal of Trauma and Acute Care Surgery	@JTraumAcuteSurg	3.4	486	6174	1458	4860	1091742	25581	7658
European Journal of Surgical Oncology	@ejsotweets	2.5	167	61	1127	2179	375228	7624	3064
Journal of Gastrointestinal Surgery	@ JournalofGISurg	3.2	26	5	203	582	91052	6190	1385
World Journal of Surgery	@WorldJSurg	2.6	38	11	199	450	107021	14489	3206
American Journal of Surgery Techniques in Coloproctology	@AmJSurgery	3	594	4002	5940	12474	521796	20286	3216
Techniques in Coloproctology	@TechColoproctol	3.3	106	134	1264	3053	594542	8676	1425
Journal of Surgical Research	@JSurgRes	2.2	65	65	398	1298	214835	9983	1386
Langenbeck's Archives of Surgery	@LAOS1860	2.3	1	0	8	30	3004	1348	272

p6m: per 6 months, T. :total

The median and minimum-maximum values for IF, total shares, total comments, total likes, total RTs, total views, and the number of account users, as well as the total number of shares for all time, are presented in Table 2. This table also includes the names of the journals with the highest values for these metrics. Additionally, the correlation r and p values with IF for these parameters are also included in Table 2. (Table 2) The median value (MD) of the Impact Factor (IF) is 3.23 (min: 2.2-max:16.9). The journal with the highest IF is determined to be "JAMA Surgery".

Table 2. Statistical analysis of the parameters

	Median	Min-max	correlation with IF. r	correlation with IF. p	the highest-ranking journal
IF	3.23	2.20 – 16.90	-	-	JAMA Surgery
T.posts *p6m*	135.00	1.00 – 906.00	0.36	0.133	BJS
T.reply *p6m*	519.00	0 – 7530.00	0.37	0.127	BJS
T.likes *p6m*	797.50	8.00 – 13590.00	0.33	0.169	BJS
T.RT *p6m*	1738.50	30.00 – 28086.00	0.33	0.790	BJS
T.view *p6m*	404061.00	3005.00 – 2022887.00	0.49	**0.037**	JAMA Surgery
Followers	12213.00	1348.00 – 55460.00	0.68	**0.002**	Annals of Surgery
Total Tweet	3135.00	272.00 – 16977.00	0.76	**<0.001**	JAMA Surgery

p6m: per 6 months, T. :total, IF: Impact Factor, r: (-1)-(+1) correlation Spearman method, p< 0,05 statistically significant

Examining the data from the last six months: The MD for the total number of shares is 135 (min:1-max:906). The highest number of shares belongs to the "British Journal of Surgery (BJS)". When the correlation with IF is examined, it is found that r=0.36 and p=0.133 (Table 2, Figure 1). The MD for the total number of comments/replies is 519 (min:0-max:7530). The highest number of comments/replies is found in the BJS. The correlation value with IF is r=0.37 and p=0.127 (Table 2, Figure 2). The MD for the total number of likes is 797.5 (min:8-max:13590). The highest number of likes is in the BJS. The correlation value with IF is r=0.33 and p=0.169 (Table 2, Figure 3). The MD for the total number of retweets (RT) is 1738.5 (min:30-max:28086). The highest number of RTs is in the BJS. The correlation value with IF is r=0.49 and p=0.037 (Table 2, Figure 4). The MD for the total number of views is 404061 (min:3005-max:2022887). The highest number of views is in the JAMA Surgery. The correlation value with IF is r=0.33 and p=0.790 (Table 2, Figure 5).

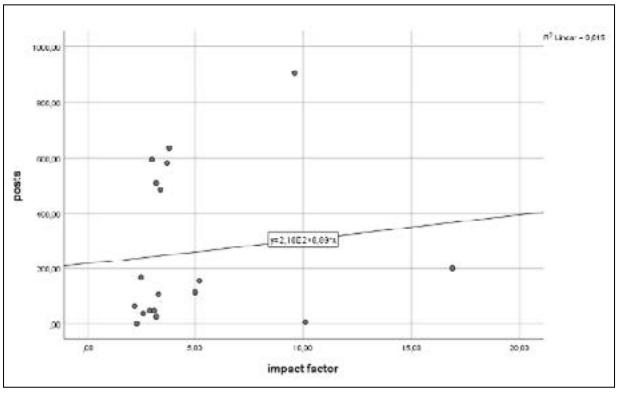


Figure 1. Correlation between IF and total shares/posts over six months

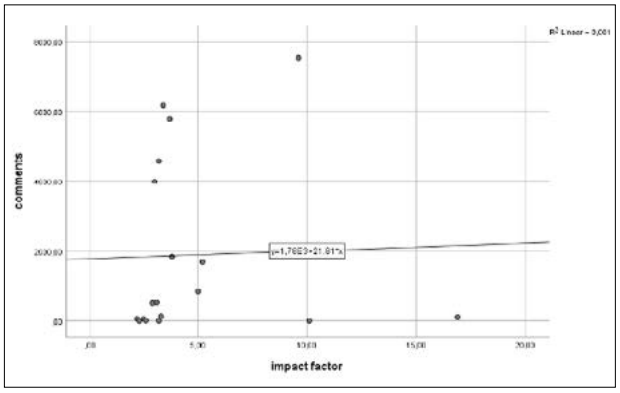


Figure 2. Correlation between IF and total comments/ replies over six months

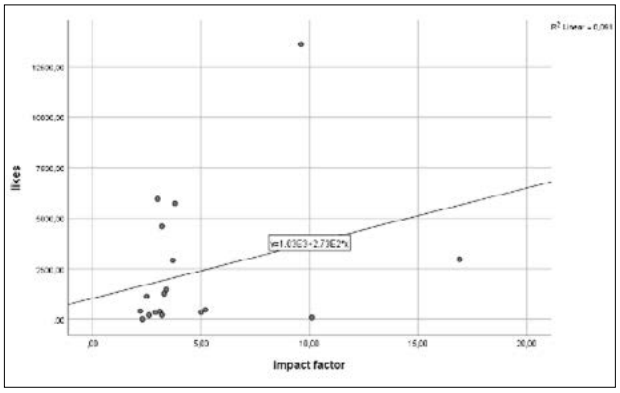


Figure 3. Correlation between IF and total likes over six months

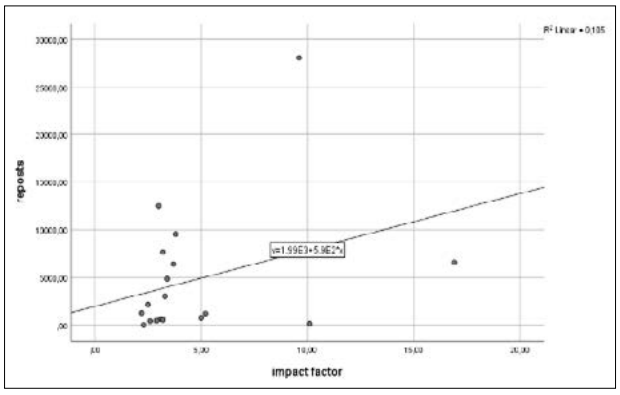


Figure 4. Correlation between IF and total reposts/RT over six months

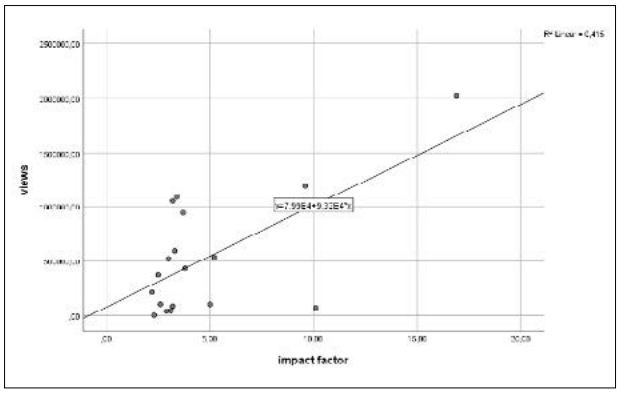


Figure 5. Correlation between IF and total views over six months

When the follower numbers of the journal accounts are examined, it is seen that the MD is 12213 (min:1348 – max: 55460). The highest number of followers belongs to the account of the "Annals of Surgery". Examining the correlation with IF, it shows a significant positive linear correlation with r=0.68 and p=0.002, which is considered to be statistically significant (Table 2, Figure 6).

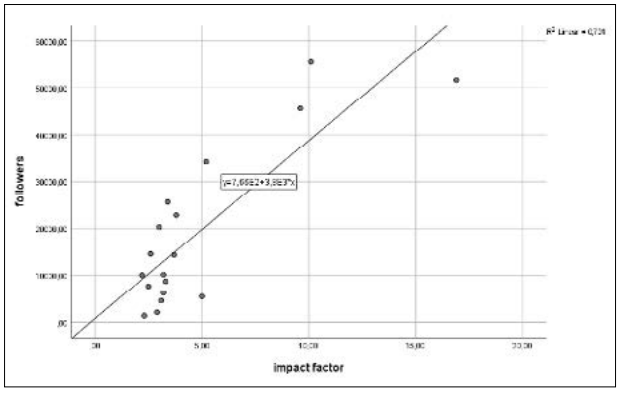


Figure 6. correlation between IF and follower count over six months

Finally, when the total number of shares (total tweets) have been evaluated since the accounts were opened, it is detected that the MD is 3135 (min: 272 – max:16977). Examining the correlation with IF, r=0.76 indicates that there is a strong significant positive linear correlation and P<0.001, which is statistically highly significant (Table 2, Figure 7).

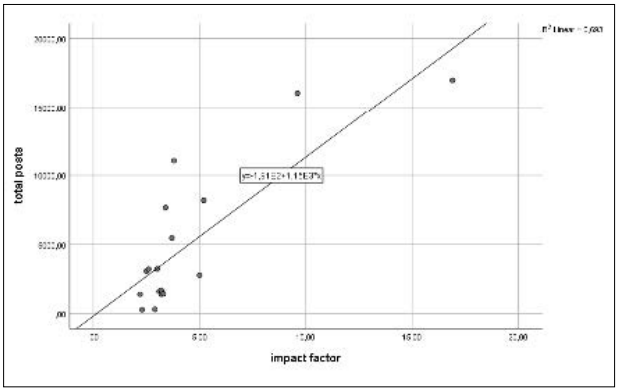


Figure 7. Correlation between IF and total number of posts

DISCUSSION

Social media has made significant contributions to medical and surgical education. Academic journals, doctors, surgeons, and medical students actively use social media for different purposes such as announcing publications, introducing new procedures and medications.(7) Using social media in this way not only facilitates information sharing, but also expands professional networks and provides faster access to information. In this context, many academic publications have been made on the use of social media in the medical field and its effects. These publications thoroughly examine the role and the importance of social media in the field of medicine.(8, 9)

In a study, it is shown that physicians use social media, particularly X (Twitter), more frequently in order to catch up on the agenda and to ensure the public has access to accurate information. This study has demonstrated that scientific journals, surgical societies, and surgeons are more active on the social media platform, resulting in an increased interaction. It is seen that on Twitter, especially under the hashtag #SoMe4Surgery, posts containing articles, guidelines, videos, and podcasts have formed a significant network for surgeons in their professional communication, access to current information, and

education. Furthermore, it has been observed that journals with high activity on social media, particularly Twitter, tend to have a high index.(10)

In this study, the total number of shares, total number of comments, total number of likes, and total number of views on the Twitter accounts of journals within the last six months have been examined to evaluate their activities. When analysing the relationship of these parameters with the IF, a significant difference and correlation have not been observed, except for the total number of views (Table 1, Figure 5). A statistically significant relationship between the total number of views and IF has been detected. ($p=0.037$)

Another study in the literature has indicated that urology journals with a Twitter profile have a higher average JIF compared to those without a Twitter profile. This suggests that the presence on social media can enhance or be associated with the perceived academic impact of a journal.(11)

In contrast to the literature, in our study, no relationship is found between the intensity and the activity of journals on social media and their Ifs. The average shares, likes, comments, and RT of all journals in the study have been similar. However, it is seen that a strong correlation has existed between the number of followers and the total number of shares since the account was opened with the IF. Consequently, it is believed that there is no significant relationship between a journal's IF and its activity or frequency of posting on social media. This discrepancy could be due to the differences in research methodology, specialty fields, or even the time period in which the study has been conducted. Our study encompasses a period when social media's influence has been at its peak, and using social media has been intense and widespread. Therefore, it is considered that the results in this study are to be more meaningful.

Given these results, it is believed that the correlation between IF and the number of followers and the total number of shares over time is attributed to the prestige of well-established and academically respected journals with high IF. The significant difference in viewing numbers is also a result of this. High IF reputable journals tend to have large numbers of followers and reach a wider audience due to their scholarly influence, even without publishing large numbers of submissions or receiving heavy interaction. In summary, although social media is seen as a new tool in impact assessment in the literature, the findings of our study suggest otherwise. (12)

In conclusion, although it is commonly thought that journals actively using social media have higher Impact Factors (IF) and that there is a strong relationship between the impact power and social media activity, our study has found no difference in average activity, number of shares, likes, comments, and RTs as IF increases. On the other hand, journals with high IF, even when making a similar number of posts and receiving a similar number of likes, comments, and RTs, tend to have more followers, a higher total number of shares, and a greater average number of views. This situation is due to the high-IF journals being more established, having a longer presence on social media, consequently having more followers, and being more reputable.

Declarations

The authors have no conflicts of interest to declare. The authors declared that this study has received no financial support.

Ethics committee approval is not required since the data related to the study were obtained from the publicly available internet environment and human participants were not included in the study.

REFERENCES

1. Teoh JY, Mackenzie G, Tortolero L, Rivas JG. Social Media Analytics: What You Need to Know as a Urologist. Eur Urol Focus. 2020;6(3):434-436.
2. Shewale R. Twitter statistics in 2023 — (Facts After "X" Rebranding). 2023. Available at https://www.demandsage.com/ twitter-statistics/ Accesed September 15, 2023
3. Kelly BS, Redmond CE, Nason GJ, Healy GM, Horgan NA, Heffernan EJ. The use of Twitter by radiology journals: An analysis of Twitter activity and impact factor. J Am Coll Radiol. 2016;13(11):1391-1396.
4. Zupanc GK. Impact beyond the impact factor. J Comp Physiol A Neuroethol Sens Neural Behav Physiol. 2014;200:113–6.
5. Asan A, Aslan A. Quartile scores of scientific journals: Meaning, importance and usage. Acta Medica Alanya. 2020;4(1):102-8.
6. Scimago Journal & Country Rank. 2023. Available at https://www.scimagojr.com/journalrank.php?category=2746&page=2&total_size=512 Accesed November 2, 2023

7. Pershad Y, Hangge PT, Albadawi H, Oklu R. Social medicine: Twitter in healthcare. J Clin Med. 2018;7(6):121.
8. Larkins K, Murphy V, Loveday BPT. Use of social media for surgical education in Australia and New Zealand. ANZ J Surg. 2020;90(6):1004-1008.
9. Ovaere S, Zimmerman DDE, Brady RR. Social media in surgical training: Opportunities and risks. J Surg Educ. 2018;75(6):1423- 1429.
10. Güler İ, Martlı HF. Social media as a tool to keep up-to-date as a physician or to reach accurate information as a patient; sharing of Turkish surgical societies and foreign surgical societies. JAMER. 2022;7(3):90-7.
11. Cardona-Grau D, Sorokin I, Leinwand G, Welliver C. Introducing the Twitter impact factor: An objective measure of urology's academic impact on Twitter. Eur Urol Focus. 2016;2(4):412-417.
12. Sousa JA, Alves IA, Donato H, Sargento-Freitas J. The Twitter factor: How does Twitter impact #Stroke journals and citation rates? Int J Stroke. 2023;18(5):586-589.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):28-35

Received: 17 July 2023
Revised: 25 October 2023
Acccepted: 25 October 2023
DOI: 10.47482/acmr.1325481

ORIGINAL ARTICLE

Use of preoperative ultrasonography adenoma size measurements for accurate localization estimation in parathyroid adenomas

Servet Kocaöz[1] **Mustafa Ömer Yazıcıoğlu**[1] **Bülent Çomçalı**[1] **Furkan Savaş**[1]
Buket Altun Özdemir[1] **Ahmet Melih Taşbaşı**[1] **Özlem Ünal**[2]
Şevket Barış Morkavuk[3] **Birol Korukluoğlu**[4]

1 Ankara City Hospital, Department of General Surgery, Breast and Endocrine Surgery Clinic, Ankara, Turkey
2 Yıldırım Beyazıt University Faculty of Medicine, Department of Radiology, Ankara, Turkey
3 Ankara City Hospital, Department of Oncological Surgery, Ankara, Turkey
4 Health Sciences University Faculty of Medicine, Department of General Surgery, İstanbul, Turkey

Abstract

Background: It is known that Primary hyperparathyroidism (pHPT) is the most common cause of hypercalcemia. It is characterized by high serum calcium and parathyroid hormone (PTH) levels. Also, hyperactivity is seen in one or more of the parathyroid glands and preoperative ultrasonography (USG) usually localizes the location of parathyroid adenomas. In this study, the factors that affect the success of parathyroid surgery have been investigated.

Methods: In total, the medical records of 245 patients with pHPT who underwent parathyroidectomy have been reviewed, retrospectively. In order to confirm the location of hyperactive parathyroid gland and the factors that affect the success of laboratory methods have been examined by using imaging techniques.

Results: As a result, false localization is found in 7.8% (19) of the patients. The weight calculated by using the preoperative USG measurements has been approximately similar to the macroscopic weight ($p = 0.651$). When the preoperative USG results in patients with false localization have been analyzed, it is seen that the lesion diameter was significantly less than 12 mm and the calculated weight was significantly less than 39 g ($p = 0.005$ and $p < 0.001$).

Conclusion: It has been concluded that a second-line imaging should be used to obtain an accurate localization in patients with a small lesion suspected of being a parathyroid adenoma on preoperative USG. In addition, an intraoperative PTH (IOPTH) should be used to increase the success rate of the surgery in patients who cannot undergo a second-line imaging.

Keywords: Minimal Invasive Parathyroidectomy, Primary Hyperparathyroidism, Ultrasonography, Parathormone.

Cite this article as: *Kocaöz S, Yazıcıoğlu MÖ, Çomçalı B, Savaş F, Özdemir Altun F, Taşbaşı MA, Ünal Ö, Morkavuk ŞB, Korukluoğlu B. Use of preoperative ultrasonography adenoma size measurements for accurate localization estimation in parathyroid adenomas. Arch Curr Med Res. 2024;5(1):28-35*

Corresponding Author:
Servet Kocaöz, Ankara City Hospital, Department of General Surgery, Breast and Endocrine Surgery Clinic, Ankara, Turkey
E-Mail: servet.kocaoz@gmail.com

INTRODUCTION

Primary hyperparathyroidism (pHPT) is the most common cause of hypercalcemia in the outpatient setting. It is characterized by hyperactivity of one or more parathyroid glands accompanied by high serum calcium levels and inappropriate PTH levels in postmenopausal women (1). While a single solitary adenoma causes pHPT in 70% to 80% of the cases, two or more glands are responsible for the disease in 20% to 30% of the cases (2,3). Parathyroid carcinoma is rarely the cause of pHPT (4,5). The only curative treatment for patients with pHPT is a surgical resection of the parathyroid adenoma that is responsible for the disease. The success rate of surgical treatment increases up to 97% thanks to the preoperative localization and the assessment of intraoperative PTH levels (6,7) and it is demonstrated by the normalization of serum calcium and PTH levels. The presence of hypercalcemia in the first 6 (six) months after surgery (3 to 6% of patients) indicates the presence of persistent or recurrent pHPT (7,8). Repeated surgical procedures might lead to an increase in complications. While recurrent laryngeal nerve (RLN) paralysis is observed in 0.3% to 0.6% of the patients with the initial surgical procedure, RLN paralysis is observed in 3% to 9% of the recurrent surgical procedures (9). In addition, the risk of permanent hypocalcemia is 7% to 8% at the first surgery and increases, reaching up to 13%, at repeated surgery (9,10). Intraoperative parathyroid hormone monitoring (IOPTH) is recommended to increase the number of minimally invasive parathyroidectomy (MIP) procedures and to prevent the development of permanent hypoparathyroidism (10). Preoperative localization studies include neck ultrasonography (US), sestamibi scintigraphy, C11-methionine PET-CT, selective venous parathyroid hormone sampling, 4D MRI imaging, and 4D CT of the parathyroid gland (2,11,12). It is reported that the sensitivity of USG is 65.5% to 87.5%, the sensitivity of MIBI is 60% to 77%, the sensitivity of 4D CT is 80% to 85.7%, and the sensitivity of 4D MRI is 85% in accurately detecting the localization of parathyroid adenoma (11-15). The exploration of 4 glands or bilateral neck exploration (BNE) in parathyroidectomy surgery increases the success rate of the surgery (16). However, in order not to increase the risk of complications and to shorten the duration of the surgery, the routine preoperative US would reduce the number of patients with BNE in chosen cases (17). However, the sensitivity of USG decreases in adenomas smaller than 1 cm (18). In order for minimally invasive parathyroidectomy to be successful, a very good localization study should be performed in the preoperative period (19). In this study, it is aimed to investigate the factors that affect the success of parathyroid surgery.

MATERIALS AND METHODS

Initially, 266 patients who were older than 18 years and underwent parathyroidectomy at the Department of General Surgery between 1st March, 2019 and 28th February, 2022 have been included in this study. The study was initiated with the approval of the Ankara City Hospital Clinical Research Ethics Committee, numbered 2266, until 29.12.2021. The medical records which belong to the patients have been reviewed, retrospectively. As a result, it is seen that 21 of the patients had undergone a surgery for secondary hyperparathyroidism before and these patients have been excluded from the study. Finally, a total of 245 patients who underwent parathyroidectomy for primary hyperparathyroidism have been included in the study. Age, gender, and preoperative biochemical parameters such as calcium (preoperative and 6 hours after surgery), phosphorus, albumin, and alkaline phosphatase levels of the patients were obtained via their medical records. Parathormone levels (preoperatively, 10 minutes after the surgical removal of the parathyroid adenoma, and 6 hours after the surgery) were also recorded. On preoperative imaging, the correct location of the parathyroid adenoma and its dimensions were also determined and recorded. The macroscopic size of the parathyroid gland, the pathology of the thyroidectomy (for those who decided to undergo thyroidectomy in the Endocrine Council), and the pathology of the parathyroid gland were recorded in each patient's follow-up form. The weight of the parathyroid glands was calculated by using the formula V (mm3) = L (mm) x W (mm) x H (mm) x $\pi/6$ of the ellipsoid volume of the adenomas, which was obtained three-dimensionally by imaging methods. The calculated volume was multiplied by 1mg/mm3 to find the weight of the adenoma, assuming that the adenoma had the density of water. W (mg) = 1mg/mm3 x V adenoma (mm3) (20).

In our hospital, the preoperative examinations of parathyroid adenoma are performed by endocrinologists. During the preoperative endocrine council (in which at least one person from our clinic participates) the USG examination is re-done. The results of these examinations and the decision of the council are regularly recorded in the hospital information system. When the presence of a

large adenoma is detected in our clinic and an obvious adenoma is detected during the surgery in the location determined by the endocrinologists with preoperative USG, some surgeons perform a frozen pathology study in addition to GIBTH, while others are satisfied with the frozen result only. In the presence of small adenomas and in the absence of adenomas in the location determined by endocrinologists with preoperative USG, frozen results with IOPTH are expected. If there is no decrease in PTH on IOPTH, 4 glands are examined to find the adenoma.

In this study, data analysis is performed by using SPSS software (25.0, IBM Corp., Armonk, NY). To present descriptive statistical analyses, numbers, percentages, means, and standard deviations are used. When the age of the patient, the longest dimension of the parathyroid gland on USG, the preoperative PTH level, and the PTH level 6 hours after the surgery in both groups with and without preoperative correct localization of the parathyroid glands have been examined by using the Kolmogorov-Smirnov test, it is found that the data shows a normal distribution among the groups ($p > .05$). Besides, when adenoma weight calculated by its size on USG and the PTH values at 10 minutes after the removal of the adenoma have been examined by using the Kolmogorov-Smirnov test, it is seen that the data does not show a normal distribution among the groups ($p < .001$). Therefore, the significance of the difference between the groups has been analyzed by using Mann-Whitney U test for adenoma weight, PTH data at 10 minutes and PTH data at 6 hours postoperatively. The significance of the difference between the groups in preoperative PTH and adenoma longest length data has been analyzed by using independent t-test. For the accurate localization, the ROC curve has been plotted with these data, and cut-off values have been determined for each. The significance of the difference between the weights calculated based on the USG measurements and the macroscopic weight has been analyzed by using the Wilcoxon test.

RESULTS

The mean age of the patients included in the study was 53.20±12.6 years. Of the patients, 78% (191) were female and 22% (54) were male. Prior to the surgery, 61.2% (150) of the patients were scheduled for MIP and 38.8% (95) of them were scheduled for 4 gland exploration and/or thyroid surgery. Among these patients, MIP could not be performed in 19 patients who were preoperatively planned as MIP, because the adenoma could not be found (11) or an intraoperative decrease in PTH level was not detected (8). For this reason, the incision was extended and the operations were continued as 4-gland exploration. It was observed that one patient with parathyroid carcinoma underwent thyroid lobectomy in addition to the parathyroidectomy, and one other patient underwent bilateral total thyroidectomy (BTT). Patients who underwent parathyroidectomy were followed for at least 6 months. Double parathyroid adenoma was present in 5.3% (13) of the patients who underwent parathyroidectomy. The presence of a double parathyroid adenoma was discovered during the surgery in 3.3% (8) of the patients and parathyroid hyperplasia was found in 9.4% (23) of the patients. To increase the success of minimally invasive parathyroidectomy in our clinic, the exploration of 4 parathyroid glands was started in patients who did not have a decrease in PTH measured 10 minutes after the removal of the parathyroid gland during surgeries. An intraoperative quick PTH was tested in 61.2% (150) of the patients, but not in 38.8% of them. In 8 of the patients who underwent MIP, the presence of a double adenoma was discovered by performing 4-gland explorations because the quick PTH value tested 10 minutes after the removal of the parathyroid gland did not decrease sufficiently. After at least 6 months of follow-up, 90.2% (221) of the patients had a normal serum PTH and calcium levels. It was observed that 7.8% (19) of the patients had preoperative misdiagnosis or inadequate localization studies. During the postoperative follow-up, 5 patients had elevated PTH levels that returned to normal after the surgery and the imaging (MR or 4DCT) demonstrated the presence of a second adenoma. While 2 of these patients underwent reoperation, 3 of the patients were referred to a thoracic surgery because one of them had an adenoma located on the aortic knob and the other had an intra-thymic adenoma. The other patient with a substernal parathyroid adenoma did not wish to undergo surgery because of concomitant systemic disease. Of the adenomas, 10.9% (28) were located in the right superior lobe, 33.7% (87) in the right inferior lobe, 10.1% (26) in the left superior lobe, 39.9% (103) in the left inferior lobe, 2.7% (7) were intrathyroidal, and 2.7% (7) were in other locations.

Firstly, the measurements have been analyzed. When the weight calculated from the three-dimensional measurements of the adenoma in the preoperative USG and the macroscopic three-dimensional measurements

and weight measurements at pathological examination were compared by using the Wilcoxon test, it is seen that there has been no significant difference between the two groups (p = 0.651). A comparison of the weight calculated from the USG measurements of the adenoma and the macroscopic weight is shown in **Table 1**.

Table 1. The comparison of the weight calculated by the USG measurements of the adenoma and the macroscopic weight

	N	Mean	Std. Deviation	Minimum	Maximum	Mean Rank	*P* Value
Macroscopic Weight	245	1.2	1.7	0.1	13.7	119.5	0.651
Weight calculated according to measurements on USG	245	1.1	1.3	0.1	10.3	116.5	

Wilcoxon test used

The patients included in the study were then divided into two groups, those with the correct localization and those without in order to analyze the effect of adenoma diameter and volume on correct localization. The longest diameter of the parathyroid measured on USG and the calculated parathyroid weight were significantly lower in the patients with preoperatively mis-localized ($p < 0.005$ and $p < 0.001$, respectively). In the analysis performed with the preoperative serum PTH levels, it is seen that there has been no difference between the groups (p = 0.079). PTH and calcium levels examined 6 hours after surgery were significantly lower in the patients who were correctly localized preoperatively ($p< 0.0001$, $p < 0.001$, respectively). A comparison of several parameters of correct adenoma localization is shown in **Table 2**.

Tables 2. The comparison of several parameters on the correct localization of the adenoma

Incorrect localization?		N	Test Value	P Value
Longest diameter on USG	No	226	2.8	0.005*
	Yes	19		
Calculated weight	No	226	1076.5	< 0.001**
	Yes	19		
Preoperative PTH	No	226	1.8	0.079*
	Yes	19		
Postoperative PTH	No	226	325.5	< 0.001**
	Yes	19		
Postoperative Calcium	No	226	1134.5	0.001**
	Yes	19		

**Independent-T test used. **Mann-Whitney U test used.*

The cut-off value for adenoma diameter measured on preoperative USG was 12 mm (AUC: 0.739, sensitivity: 0.668, specificity: 0.684). The ROC curve for the longest adenoma size according to whether the correct localization was performed preoperatively is shown in **Figure 1**. The cut-off value for the preoperative adenoma weight measured in the preoperative USG was 39 gr (AUC: 0.749, sensitivity: 0.673, specificity: 0.684). The ROC curve for the size of the adenoma weight calculated according to whether the correct localization was performed preoperatively is shown in **Figure 2**. The cut-off value of PTH was set at 182 pg/mL to accurately localize the

parathyroid adenoma preoperatively. It was observed that the location of the adenoma was better localized when the PTH level was above 182 pg/mL (AUC: 0.647, sensitivity: 0.584, specificity: 0.632). The sensitivity for correct gland removal was 0.97 and the specificity was 0.90 in the patients with a 50% or greater reduction in IOPTH compared to preoperative PTH (136/140). The cut-off value for IOPTH was 39 pg/mL. In patients with a value below this, the correct removal of the gland (86/140), the sensitivity and specificity were calculated to be 0.61 and 0.60. The ROC curve was plotted for PTH measured at hour 6 postoperatively. The cut-off for PTH at hour 6 was 41 pg/mL (AUC: 0.925, sensitivity: 0.842, specificity: 0.841). Similarly, the cut-off for postoperative calcium at hour 6 was 9.2 mg/dL (AUC: 0.736, sensitivity: 0.632, specificity: 0.726). A comparison of the cut-off values of several parameters in determining the correct localization of the adenoma is shown in **Table 3**. The effective parameters in determining the preoperative correct localization of the adenoma are shown in **Table 4**.

Tables 3. The comparison of the cut-off values of several parameters in determining the correct localization of the adenoma

			Preoperative Correct localization		P value
			Yes	No	
Adenoma Longest Diameter	< 12 mm	N	78	13	0.003
		%	85.7	14.3	
	≥12 mm	N	148	6	
		%	96.1	3.9	
Adenoma weight	< 39 gr	N	74	13	0.002
		%	85.1	14.9	
	≥ 39 gr	N	152	6	
		%	96.2	3.8	
Preoperative PTH Level	<182 pg/mL	N	94	12	0.068
		%	88.7	11.3	
	≥182 pg/mL	N	132	7	
		%	95	5	
Postoperative PTH Level	≥ 41 pg/mL	N	37	16	<0.001
		%	69.8	30.2	
	< 41 pg/mL	N	189	3	
		%	98.4	1.6	
Postoperative Calcium Level	≥ 9.2	N	62	12	0.001
		%	83.8	16.2	
	< 9.2	N	164	7	
		%	95.9	4.1	
Total		N	226	19	
		%	92.2	7.8	

Pearson Chi-Square test used.

Tables 4. The effective parameters in determining the preoperative correct localization of the adenoma

Parameters	AUC	Sensitivity	Specificity
Preop. PTH ≥ 182 pg/mL	0.65	0.58	0.63
Longest diameter ≥12mm	0.74	0.67	0.68
Adenoma weight ≥ 39 gr	0.75	0.67	0.68
Postop. 6th hour PTH < 41 pg/mL	0.93	0.84	0.84
Postop. 6th hour Ca++ < 9.2 mg/dL	0.74	0.63	0.73

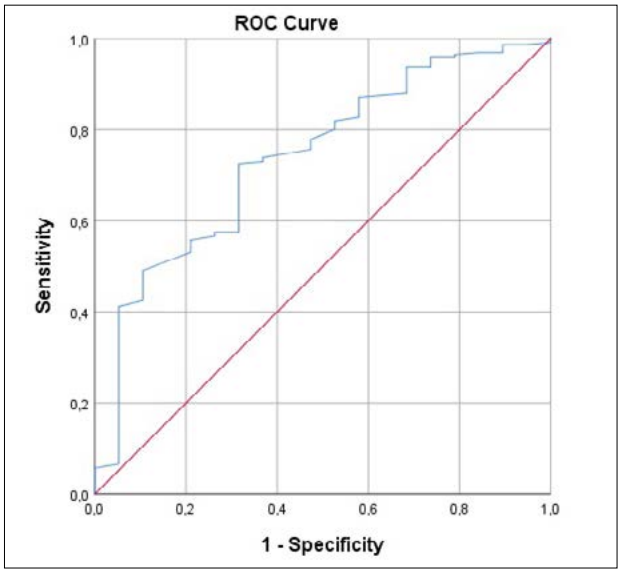


Figure 1. ROC curve for the longest adenoma size according to whether the correct localization was performed preoperatively.

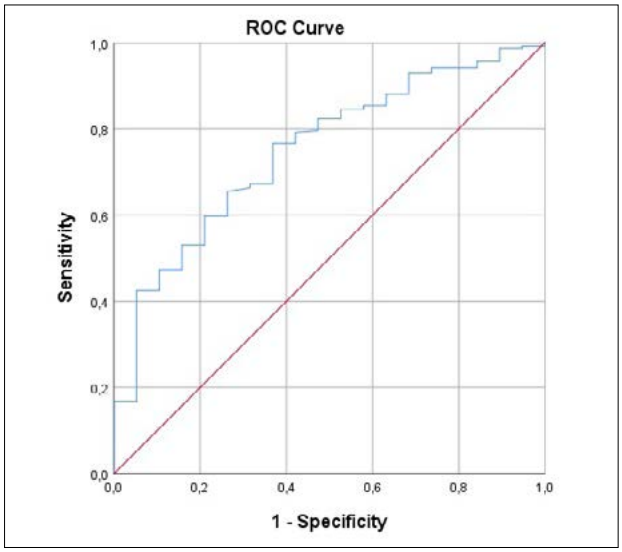


Figure 2. ROC curve for the size of the adenoma weight calculated according to whether the correct localization was performed preoperatively.

The sensitivity decreases down to 0.58 and the specificity increases up to 0.79 when the adenoma weight is considered to be 50 gr, which is the cut-off value reported in previous studies in the literature (20).

It has been observed that the preoperative MIBI has never been performed in 80 patients. The localization of 81.2% (134/165) of the adenomas was accurately determined by MIBI.

DISCUSSION

This study is based on the analysis of a cohort of 245 patients with pHPT who underwent surgery at a single center over a 3-year period. It has been determined that when parathyroid adenomas are minimally enlarged, the localization becomes difficult. The serum PTH level and the weight of the gland are important in determining its location (21,22). Calva-Cerqueira et al. (21) have reported that the sensitivity of imaging decreased in patients with preoperative serum PTH levels below 101 pg/mL. There have been excellent cure rates (97-99%) which are reported for parathyroidectomy performed by experienced endocrine surgeons, regardless of the size of the parathyroid adenoma (23). However, persistent/recurrent pHPT is seen in 2 to 10% of the patients with pHPT after surgery (24,25). Goodsell et al. (25) have determined that the presence of a double adenoma was associated with persistent/recurrent pHPT. In a recent study, Mazotas et al. (26) have concluded that the presence of a double parathyroid adenoma do not increase postoperative recurrence; however, persistent pHPT has been reported to be more common in patients with a double parathyroid adenoma.

First-line imaging modalities, including USG and technetium-99m sestamibi, were initially used to localize parathyroid adenomas because of their high accuracy rates. Preoperative USG is a valuable tool for preoperative localization of parathyroid adenoma. However, its use in the detection of double adenoma or multi-gland disease is limited. The sensitivity of USG decreases down to 78.5% in single adenoma, 34.9% in multi-gland disease, and 16.2% in double adenoma. The sensitivity of sestamibi scintigraphy decreases down to 88.4% for single adenoma, 44.5% for multiglandular hyperplasia, and 30% for double adenoma (27,28). Dy et al. (29) have reported that the postoperative cure rate was 89% in patients with negative USG results and negative MIBI. Therefore, in cases where USG and technetium-99m sestamibi imaging

are insufficient, 4-dimensional CT and MRI, which are second-line imaging modalities, are used. The correct localization of preoperative double adenoma on 4D MRI has been reported to be 85% in pHPT cases (11). Acar et al. (30) have determined that 4D CT and 4D MRI successfully localized the parathyroid adenoma with a rate of 52.9% and 84%, respectively.

It is recommended to examine the paraoesophageal and paratracheal regions, as well as the anterior and posterior mediastinal regions to locate a minimally enlarged parathyroid adenoma in patients examined with USG and MIBI. It is also recommended to use 18 F-fluorocholine-PET-CT or C11-methionine-PET-CT (91-100% sensitivity) in addition to 4D CT and 4D MRI to locate these adenomas (31,32). In the presence of a suspicious adenoma in the neck on USG, surgery should be started with MIP, and after the removal of the mass thought to be an adenoma, a quick PTH should be studied (33,34). It should be noted that if a good preoperative localization is not performed, IOPTH monitoring and selective venous PTH measurement would increase the duration of the operation and the cost (35).

The size of parathyroid adenomas affects the success rate of localization studies for pHPT. Stucken et al. (36) have shown that the weight of the parathyroid gland can be accurately estimated by preoperative USG and 4D CT. Similarly, our study has demonstrated that there has been no significant difference between the weight of the parathyroid gland calculated by using the three dimensions measured by USG and the pathological weight. It has been reported that the localization sensitivity decreases when the weight of the parathyroid adenoma calculated by 4D CT which is less than 50 mg (20,36). This study determines that in patients with preoperative USG measurements of less than 12 mm in the longest diameter of the parathyroid gland and less than 50 mg in weight, second-line studies are required to differentiate the normal parathyroid tissue from adenoma.

IOPTH measurements were taken 10 minutes after the removal of the lesion thought to be a parathyroid adenoma during surgery. A 50% or greater decrease in preoperative PTH or an IOPTH of 35 pg/mL or less is considered to be the indication of correct adenoma removal (92-98.8%) (37,38). In this study, the sensitivity of correct adenoma removal is found to be 97% in patients with a 50% reduction in IOPTH. Similarly, the PTH level at the 6-hour postoperative cut-off of 41 pg/mL had a sensitivity of 84%, but did not contribute to the correct adenoma removal. The addition of IOPTH to focused parathyroidectomy has shown similar long-term results compared to bilateral neck exploration (39).

The limitation of the study is that it is a retrospective study. Therefore, the same standard procedure cannot be applied to each patient. The importance of the study is that the endocrine surgery is very common in our clinic and the records are kept on a regular basis.

As a result, it can be stated that most parathyroid adenomas can be accurately localized with preoperative USG and MIBI. Second-line imaging should be performed when the suspected adenoma lesion is less than 12 mm in longest diameter and the calculated weight on USG is less than 39 g. Also, parathyroidectomy should be planned after second-line imaging in patients in whom parathyroid adenomas are not found outside the neck (retrosternal, infraclavicular, mediastinum, etc.). IOPTH should be studied in these patients, and bilateral neck exploration should be performed in patients who do not have a 50% decrease in PTH.

Declarations

The authors have no conflicts of interest to declare. The authors declared that this study has received no financial support.

This study was approved by the clinical research Ethics Committee of the Ankara City Training and Research Hospital (Date: 29.12.2021, Number: 2266)

REFERENCES

1. Silva BC, Cusano NE, Bilezikian JP. Primary hyperparathyroidism. Best Pract Res Clin Endocrinol Metab. 2018;32(5):593-607.
2. Hendricks A, Lenschow C, Kroiss M, Buck A, Kickuth R, Germer C, et al. Evaluation of diagnostic efficacy for localization of parathyroid adenoma in patients with primary hyperparathyroidism undergoing repeat surgery. Langenbecks Arch Surg. 2021 ;406(5):1615-1624.
3. Nawrot I, Chudziński W, Ciąćka T, Barczyński M, Szmidt J. Reoperations for persistent or recurrent primary hyperparathyroidism: results of a retrospective cohort study at a tertiary referral center. Med Sci Monit. 2014; 20: 1604-1612.
4. Lee PK, Jarosek SL, Virnig BA, Evasovich M, Tuttle TM. Trends in the incidence and treatment of parathyroid cancer in the United States. Cancer. 2007;109(9):1736-41.
5. Lenschow C, Schrägle S, Kircher S, Lorenz K, Machens A; NEKAR study group. Clinical presentation, treatment, and outcome of parathyroid carcinoma: Results of the NEKAR retrospective international multicenter study. Ann Surg. 2022;275(2):e479-e487.

6. Tolley N, Garas G, Palazzo F, Prichard A, Chaidas K, Cox J, et al. Long-term prospective evaluation comparing robotic parathyroidectomy with minimally invasive open parathyroidectomy for primary hyperparathyroidism. Head Neck. 2016;38 Suppl 1:E300-6.
7. Venkat R, Kouniavsky G, Tufano RP, Schneider EB, Dackiw AP, Zeiger MA. Long-term outcome in patients with primary hyperparathyroidism who underwent minimally invasive parathyroidectomy. World J Surg. 2012;36(1):55-60.
8. Yeh MW, Wiseman JE, Chu SD, Ituarte PH, Liu IL, Young KL, et al. Population-level predictors of persistent hyperparathyroidism. Surgery. 2011;150(6):1113-9.
9. Singh Ospina NM, Rodriguez-Gutierrez R, Maraka S, Espinosa de Ycaza AE, Jasim S, Castaneda-Guarderas A, et al. Outcomes of parathyroidectomy in patients with primary hyperparathyroidism: A systematic review and meta-analysis. World J Surg. 2016;40(10):2359-77.
10. Richards ML, Thompson GB, Farley DR, Grant CS. Reoperative parathyroidectomy in 228 patients during the era of minimal-access surgery and intraoperative parathyroid hormone monitoring. Am J Surg. 2008;196(6):937-42; discussion 942-3.
11. Memeh KO, Palacios JE, Khan R, Guerrero MA. Pre-operative localization of parathyroid adenoma: performance of 4D MRI parathyroid protocol. Endocr Pract. 2019 ;25(4):361-365.
12. Bunch PM, Randolph GW, Brooks JA, George V, Cannon J, Kelly HR. Parathyroid 4D CT: What the surgeon wants to know. Radiographics. 2020;40(5):1383-1394.
13. Wong W, Foo FJ, Lau MI, Sarin A, Kiruparan P. Simplified minimally invasive parathyroidectomy: a series of 100 cases and review of the literature. Ann R Coll Surg Engl. 2011;93(4):290-3.
14. Binks M, Burrows D, Littlejohn D. A rural perspective on minimally invasive parathyroidectomy: optimal preoperative imaging and patient outcomes. ANZ J Surg. 2019 ;89(1-2):43-47.
15. Eller M, Dave A, Johnson C, Fingeret AL. Accuracy of 4-Dimensional computed tomography for localization in primary hyperparathyroidism. J Surg Res. 2021;257:15-21.
16. Berber E, Parikh RT, Ballem N, Garner CN, Milas M, Siperstein AE. Factors contributing to negative parathyroid localization: an analysis of 1000 patients. Surgery. 2008;144(1):74-9.
17. Bradley SJ, Knodle KF. Ultrasound based focused neck exploration for primary hyperparathyroidism. Am J Surg. 2017 ;213(3):452-455.
18. Stern S, Tzelnick S, Mizrachi A, Cohen M, Shpitzer T, Bachar G. Accuracy of neck ultrasonography in predicting the size and location of parathyroid adenomas. Otolaryngol Head Neck Surg. 2018;159(6):968-972.
19. Nawrot I, Chudziński W, Ciąćka T, Barczyński M, Szmidt J. Reoperations for persistent or recurrent primary hyperparathyroidism: results of a retrospective cohort study at a tertiary referral center. Med Sci Monit. 2014;20:1604-12.
20. Yeh R, Tay YD, Dercle L, Bandeira L, Parekh MR, Bilezikian JP. A simple formula to estimate parathyroid weight on 4D-CT, predict pathologic weight, and diagnose parathyroid adenoma in patients with primary hyperparathyroidism. Am J Neuroradiol. 2020;41(9):1690-1697.
21. Calva-Cerqueira D, Smith BJ, Hostetler ML, Lal G, Menda Y, O'Dorisio TM, et al. Minimally invasive parathyroidectomy and preoperative MIBI scans: correlation of gland weight and preoperative PTH. J Am Coll Surg. 2007;205(4 Suppl):S38-44.
22. Abdel-Aziz TE, Gleeson F, Sadler G, Mihai R. Dwarfs and giants of parathyroid adenomas-no difference in outcome after parathyroidectomy. J Surg Res. 2019;237:56-60.
23. Neychev VK, Ghanem M, Blackwood SL, Aragon Han P, Fazeli R, Schneider E, et al. Parathyroid surgery can be safely performed in a community hospital by experienced parathyroid surgeons: A retrospective cohort study. Int J Surg. 2016;27:72-76.
24. Kartal A, Çitgez B, Öden S, Yetkin SG, Mihmanlı M, Aygün N, et al. Risk factors in the occurance of persistent primary hyperparathyroidism. Med Bull Sisli Etfal Hosp 2014;48:213–226.
25. Goodsell KE, Ermer JP, Zaheer S, Kelz RR, Fraker DL, Wachtel H. Double adenoma as a cause of primary hyperparathyroidism: Asymmetric hyperplasia or a distinct pathologic entity? Am J Surg. 2021;222(3):483-489.
26. Mazotas IG, Yen TWF, Doffek K, Shaker JL, Carr AA, Evans DB, et al. Persistent/Recurrent primary hyperparathyroidism: Does the number of abnormal glands play a role? J Surg Res. 2020;246:335-341.
27. Ruda JM, Hollenbeak CS, Stack BC Jr. A systematic review of the diagnosis and treatment of primary hyperparathyroidism from 1995 to 2003. Otolaryngol Head Neck Surg. 2005 ;132:359-372.
28. Choi JH, Jayaram A, Bresnahan E, Pletcher E, Steinmetz D, Owen R, et al. The role of surgeon-performed office and preincision ultrasounds in localization of parathyroid adenomas in primary hyperparathyroidism. Endocr Pract. 2022;28(7):660-666.
29. Dy BM, Richards ML, Vazquez BJ, Thompson GB, Farley DR, Grant CS. Primary hyperparathyroidism and negative Tc99 sestamibi imaging: to operate or not? Ann Surg Oncol. 2012;19(7):2272-8.
30. Acar N, Haciyanli M, Coskun M, Erdogan NK, Celik SC, Haciyanli SG, et al. Diagnostic value of four-dimensional computed tomography and four-dimensional magnetic resonance imaging in primary hyperparathyroidism when first-line imaging was inadequate. Ann R Coll Surg Engl. 2020;102(4):294-299.
31. Graves CE, Hope TA, Kim J, Pampaloni MH, Kluijfhout W, Seib CD, et al. Superior sensitivity of 18F-fluorocholine: PET localization in primary hyperparathyroidism. Surgery. 2022;171(1):47-54.
32. Hendricks A, Lenschow C, Kroiss M, Buck A, Kickuth R, Germer CT, et al. Evaluation of diagnostic efficacy for localization of parathyroid adenoma in patients with primary hyperparathyroidism undergoing repeat surgery. Langenbecks Arch Surg. 2021;406(5):1615-1624.
33. Dobrinja C, Santandrea G, Giacca M, Stenner E, Ruscio M, de Manzini N. Effectiveness of Intraoperative Parathyroid Monitoring (ioPTH) in predicting a multiglandular or malignant parathyroid disease. Int J Surg. 2017;41 Suppl 1:S26-S33.
34. Gücek Hacıyanlı S, Acar N, Ballı Ö, Erdoğan N, Hacıyanlı M. Selective venous sampling in primary hyperparathyroidism: Is it worth doing? Turk J Med Sci. 2022;52(1):144-149.
35. Laxague F, Angeramo CA, Armella ED, Valinoti AC, Mezzadri NA, Fernández Vila JM. Preoperative matching studies in the diagnosis of parathyroid adenoma for primary hyperparathyroidism: Can we avoid intraoperative PTH monitoring? Cir Esp (Engl Ed). 2021;99(8):572-577.
36. Stucken EZ, Kutler DI, Moquete R, Kazam E, Kuhel WI. Localization of small parathyroid adenomas using modified 4-dimensional computed tomography/ultrasound. Otolaryngol Head Neck Surg. 2012;146(1):33-9.
37. Riss P, Kaczirek K, Heinz G, Bieglmayer C, Niederle B. A "defined baseline" in PTH monitoring increases surgical success in patients with multiple gland disease. Surgery. 2007;142(3):398-404.
38. Barczyński M, Gołkowski F, Nawrot I. The current status of intraoperative iPTH assay in surgery for primary hyperparathyroidism. Gland Surg. 2015 ;4(1):36-43.
39. Patel KN, Caso R. Intraoperative Parathyroid Hormone Monitoring: Optimal Utilization. Surg Oncol Clin N Am. 2016 ;25:91-101.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):36-41

Received: 20 August 2023
Revised: 14 January 2024
Acccepted: 15 January 2024
DOI: 10.47482/acmr.1346584

ORIGINAL ARTICLE

The role of general surgery consultations on patient diagnosis and treatment in the Tertiary Medical Center

Saygın Altıner[1] İbrahim Kurtoğlu[1] Enes Doğanay[1] Muhammed Durmuş[1] Kadir Can Şahin[1] Özge Tonbuloğlu Altıner[2] Asiye Uğraş Dikmen[2] Ahmet Çağrı Büyükkasap[3] Aydın Yavuz[3] Mevlüt Recep Pekcici[1] Aziz Mutlu Barlas[1]

1 Ankara Training and Research Hospital, Department of General Surgery, Ankara, Turkey
2 Gazi University Faculty of Medicine, Department of Public Health, Ankara, Turkey
3 Gazi University Faculty of Medicine, Department of General Surgery, Ankara Turkey

Abstract

Background: The field of general surgery is an important one in medicine. It includes the systems and organs connected to practically every bodily part. Because of this, general surgery is frequently requested for consultation and has a significant role in emergency service applications. The study's objective is to evaluate general surgery consultations based on their specific attributes.

Methods: A retrospective analysis was performed on 814 patients who were consulted at our hospital's general surgery clinic between January and June 2021. The departments requesting consultation, the reasons for the consultation, the examinations requested before and after the consultation, and the decisions made after the consultation were evaluated.

Results: The department that required the most consultation from the general surgery branch was the emergency department with 91.5% the most common reason for consultation is nonspecific abdominal pain with 18.1% has been seen. General surgery consultation in patients presenting with abdominal specific complaints, previously ultrasonography and computed tomography were requested in 88.6% of patients.

Conclusion: The fact that physicians request unnecessary consultations and resort to advanced imaging examinations with the reservation of malpractice leads to an increase in both cost and intensity for the health system. Requesting a consultation in conditions where it is more necessary will relieve the intensity of the health system.

Keywords: General Surgery, Consultation, Emergency Department, Malpractice.

Cite this article as: *Altıner S, Kurtoğlu İ, Doğanay E, Durmuş M, Şahin KC, Altıner Tonbuloğlu Ö, Dikmen Uğraş A, Büyükkasap AÇ, Yavuz A, Pekcici MR, Barlas MA. The role of general surgery consultations on patient diagnosis and treatment in the Tertiary Medical Center. Arch Curr Med Res. 2024;5(1):36-41*

Corresponding Author:
Ahmet Çağrı Büyükkasap, Department of General Surgery ,Gazi University Faculty of Medicine,Ankara, Turkey
E-Mail: cagribk@gmail.com

INTRODUCTION

Seeking the advice of a different medical professional regarding a diagnosis, course of therapy, or follow-up for a procedure requiring medical intervention is known as consultation (1). The accountable doctor shall submit the case in writing to the appropriate department following the patient's evaluation and determination that the patient lacks information about the case or needs to see someone in a different area of competence. Likewise, following the patient's examination, the pertinent department ought to notify the supervising physician in writing (2, 3). Ethically, the primary physician should comply with the recommendations given by the consulted physician (4, 5, 6). General surgery is a major branch of medicine. It covers organs and systems that are associated with almost every part of the body. Therefore, general surgery has a key place in emergency department admissions and is frequently asked for consultation. Still, research on this subject remains very limited in the literature (1, 7).

A efficient consultation process is beneficial to the diagnostic and treatment procedure. However, unnecessary consultation requests lead to increased medical costs and expose patients to pointless imaging procedures in the process of making a diagnosis. (8). Delays in diagnostic or treatment procedures may result from this.

The current study focuses into the problems of consultation, treatment options, required examinations, and necessity of consultation in order to analyze and categorize the consultations that the department of general surgery receives requests for.

MATERIALS AND METHODS

This study was approved by the clinical research Ethics Committee of the Ankara Education and Research Hospital (Date: 29.09.2021, Number: 757). 814 patients who were consulted to our hospital's general surgery clinic between January 1 and June 1, 2021, were the subject of a retrospective analysis. We recorded the departments that requested consultation, the reasons for asking for consultation, the examinations requested before consultation, the examinations requested by the general surgeon after consultation, and the outcomes of consultation. We also reanalyzed the reasons for consultation under abdomen-specific complaints. This group included In-Vehicle Traffic Accident, Acute Appendicitis, Nonspecific Abdominal Pain, Nausea, Trauma, Diverticulitis, Stab or Cut Wounds, Gastrointestinal Bleeding, Foreign Body Ingestion, Ileus, Incarcerated Hernia, Constipation, Cholangitis, Choledocholithiasis, Cholelithiasis, Pancreatitis, and Falls from Height.

Statiscal Analyses

We analyzed the data using the SPSS 23.0 software (Statistical Package for Social Sciences). We used descriptive statistics to evaluate the data. Categorical variables are given as numbers and percentages, and continuous variables as mean ± standard deviation. Ethics Committee Approval(29.09.2021, E-21-757 , Ankara Training And Research Hospital). This study was conducted according to Helsinki declaration.

RESULTS

We looked into a total of 814 consultations. The mean age of the patients was 49±20 years. 406 (49.9%) of the patients were male and 408 (50.1%) were female. Regarding the distribution of departments that requested consultation from general surgery, the emergency department ranked first with 745 patients (91.5%), followed by internal medicine with 17 (2.1%), anesthesia – intensive care unit with 15 (1.8%), and infectious diseases clinic with 10 (1.2%). Table 1 shows the distribution of all departments that requested consultation from general surgery.

Table 1. Distribution of Departments That Requested Consultation from General Surgery

Department	Number	%*
Emergency Department	745	91.5
Internal Medicine	17	2.1
Anesthesia – ICU	15	1.8
Infection	10	1.2
Internal Medicine – ICU	7	0.9
Gynecology and Obstetrics	7	0.9
Cardiovascular Surgery	6	0.7
Orthopedics and Traumatology	4	0.5
Plastic Surgery	2	0.2
Urology	1	0.1
Total	814	100

**Column percentage*

ICU: Intensive Care Unit

We divided the cases that were consulted from the general surgery clinic into 23 groups by their preliminary diagnosis/diagnosis. The most common pre-diagnoses/diagnoses for consultation were nonspecific abdominal pain (18.1%), cholecystitis (15.0%), perianal diseases (14.5%), and acute appendicitis (13.4%). Table 2 shows the distribution of reasons for requesting consultation from general surgery.

Table 2. Distribution of Reasons for Requesting Consultation from General Surgery

Reasons for Requesting Consultation	Number	%*
Nonspecific Abdominal Pain	147	18.1
Cholecystitis	122	15.0
Perianal Diseases	118	14.5
Acute Appendicitis	109	13.4
Ileus	62	7.6
Incarcerated Hernia	54	6.6
Cholelithiasis	40	4.9
Breast – Axilla Complaints	28	3.4
Chronic Wound	21	2.6
Postoperative	19	2.3
Pancreatitis	17	2.1
Gastrointestinal Bleeding	13	1.6
Diverticulitis	11	1.4
Choledocholithiasis	9	1.1
Nausea	8	1.0
Constipation	6	0.7
Fall from Height	5	0.6
Inguinal Abscess	5	0.6
Stab – Cut Wounds	4	0.5
In-Vehicle Traffic Accident	4	0.5
Fournier's Gangrene	3	0.4
Cholangitis	2	0.2
Foreign Body Ingestion	2	0.2
Rectus Sheath Hematoma	2	0.2
Stoma Bleeding	2	0.2
Trauma	1	0.1
Total	814	100

**Column percentage*

Table 3 shows the distribution of the required tests before and after general surgery consultation. Before consultation, the most frequently requested tests were blood test (76.4%), ultrasound (43.5%), and computed tomography (42.4%). After evaluation by a general surgeon, the most frequently requested tests were blood test (11.5%) and computed tomography (9.2%). Besides, the general surgery clinic requested further consultation from other departments in 168 patients, most frequently from internal medicine (93 patients, 55.3%) and gynecology and obstetrics (36 patients, 21.4%).

Table 3. Distribution of Required Tests Before and After General Surgery Consultation

Requested Test (n=814)	Before General Surgery Consultation	After General Surgery Consultation
	Number (%)	Number (%)
Blood Test	622(76.4)	94(11.5)
Complete Urinalysis	109(13.4)	4(0.5)
Standing Direct Abdominal X-Ray	69 (8.5)	19(2.3)
Ultrasound	354 (43.5)	8(1.0)
Computed Tomography	345 (42.4)	75(9.2)
Other Imaging Methods (MRI, MRCP, RDUS)	0(0.0)	7(0.8)
Endoscopy/Colonoscopy/ERCP	0(0.0)	4(0.5)

We observed that 18.9% of all patients examined by general surgery were discharged after outpatient treatment, 15.6% were hospitalized without emergency surgery, and 15.4% were taken to emergency surgery. In 50.1% of the patients no pathology indicating emergency surgery was found (Table 4).

Table 4. Distribution of General Surgery Consultation Outcomes

General Surgery Consultation Outcomes (n=814)	Number (%)
Emergency Surgery	125(15.4)
Hospitalization Without Emergency Surgery	127(15.6)
Discharge After Outpatient Treatment	154(18.9)
No Pathology Requiring Emergency Surgery	408(50.1)

Table 5 presents the frequency of imaging requested from patients presenting with abdomen-specific complaints before general surgery consultation and the distribution of their consultation outcomes. Accordingly, imaging was requested in 88.6% of patients who presented with abdomen-specific complaints before general surgery consultation. After these patients were investigated by the general surgery clinic, 20.3% were indicated for emergency surgery, 20.1% were hospitalized without emergency surgery, 3.6% were discharged after outpatient treatment, and 56.0% displayed no pathology requiring emergency surgery.

Table 5. Frequency of Imaging Requested from Patients Presenting with Abdomen-Specific Complaints Before General Surgery Consultation and Distribution of Consultation Outcomes

		Number (%)
Imaging Requested Before General Surgery Consultation (n=616)		
	Yes	546(88.6)
	No	70(11.4)
Consultation Outcomes of Cases Requiring Imaging (n=546)		
	Emergency Surgery	111(20.3)
	Hospitalization Without Emergency Surgery	110(20.1)
	Discharge After Outpatient Treatment	19(3.6)
	No Pathology Requiring Emergency Surgery	306(56.0)

DISCUSSION

Recent years have seen an increase in the number of specializations and the general expansion of subspecialties in medicine, making comprehensive patient assessments increasingly challenging. Doctors are referring to consultations more frequently as a result. Additionally, because they want to share responsibility and are wary of making mistakes, doctors who want to avoid malpractice frequently use consultations excessively. Physicians are pushed towards more advanced imaging modalities mostly by the need to comply with patient expectations and avoid malpractice. (8, 9). Certain imaging modalities, such as computed tomography, magnetic resonance imaging, and ultrasonography, result in financial drawbacks when they are requested more frequently than required out of concern about malpractice (10). This raises the workload, reduces the amount of time spent with each patient, and raises the cost of healthcare. The concept of consultation should not be considered simply an exchange of treatment ideas between two physicians. Complicated cases that may involve numerous branches of medicine could require a multidisciplinary evaluation for planning treatment.

In this study, we found that general surgery was the most often consulted by the emergency department. The emergency department is one of the most crucial departments because of its demanding and stressful work environment, high admission rate during the day, and need for precise application of the triage mechanism. Located in a densely populated area, our hospital is a tertiary healthcare facility. Our hospital's emergency room received **1200** patient admissions each day on average during the study period. Overcrowding, longer waiting times, unnecessary testing and treatment, and increased emergency healthcare expenses are the outcomes of needless emergency admissions for non-emergency patients (11).

Given the national and international literature on the subject, there seem to be a limited number of studies on general surgery clinic consultations. In the present research, 50.1% of cases were not indicated for emergency surgery, treatment, or hospitalization with follow-up. Similar to our findings, one retrospective research found

that 62% of patients had no pathology requiring urgent surgical intervention (1). Another study from a thoracic surgery clinic reported that consultation requests mostly came from the emergency department with a rate of 51%, and 42% of these cases displayed no pathology concerning the thoracic surgery clinic (12).

In the current study, ultrasonography or computed tomography was requested in 546 patients with abdomen-specific complaints in addition to physical examination before consulting general surgery. After evaluations by the general surgery clinic, 20.3% of these cases required emergency surgery, while 56% did not receive indirect surgical intervention or follow-up. Despite the clinical benefits and advantages of computed tomography, researchers believe that it is overused (13). Computed tomography and abdominal ultrasonography are costly examinations that are laborious and time-consuming for the radiology department. Also, considering the radiation emitted from computed tomography, the cumulative radiation risk will obviously increase patients' cancer risk in the future. Research shows that 1-2% of all cancers in the UK and the USA could be associated with ionizing radiation exposure from computed tomography, one of the greatest sources of exposure to radiation (9, 14).

A medical term that has recently come into use attracts attention. Defensive Medicine. Defensive medicine is defined as a physician's deviation from what is considered usual or good practice in order to reduce or avoid complaints or criticism by patients or their families (15). The United States Congress has expanded this definition to include the act of ordering tests, procedures, or avoiding high-risk patients or procedures in order to reduce malpractice liability (16). According to the results of the study conducted in the United Kingdom, 59% of doctors practice defensive medicine by ordering unnecessary tests and feel safe. In addition, 55% of doctors stated that they asked for consultation from other departments unnecessarily(17). A study of more than 1200 orthopedists in the USA reveals a bigger problem. 96% of the respondents stated that they practiced defensive medicine by ordering unnecessary imaging, laboratory tests, consultation or hospitalization to avoid malpractice. The cost of defensive medicine practiced by orthopedists has been estimated to cost approximately 2 billion dollars per year(18).

Defensive medicine practices to avoid malpractice are likely to have irreversible effects on the healthcare system. Accordingly, unnecessary consultations and imaging methods will increase the cost and workload of health care and put a strain on the health system.

Requesting consultations and diagnostic tests only for the appropriate patients and ensuring that the triage mechanisms in emergency units work efficiently have a significant role in classifying patients based on their urgency or relevant department and reducing the financial burden (4, 19).

The general surgery clinic is active every hour of the day and every day of the week, responding to multiple needs, both elective and urgent. Doctors who request more examinations and consultations than necessary because they are afraid of malpractice or incomplete procedures further increases the workload of general surgery clinics. Improving the overall quality of basic medical education can reduce workload and consultations between units. Finally, policymakers should introduce and enforce regulations that provide legal support to physicians and allow them to practice their profession with more freedom.

Declarations

The authors have no conflicts of interest to declare. The authors declared that this study has received no financial support.

This study was approved by the clinical research Ethics Committee of the Ankara Education and Research Hospital (Date: 29.09.2021, Number: 757).

REFERENCES

1. Kahramanca Ş, Kaya O, Azılı C, Güzel H, Özgehan G, İrem B. The role of general surgery consultations in patient management. Ulus Cerrahi Derg. 2013;29:20-24.
2. Stolle JK, Mascha EJ, Kester L, Haney D. Randomized controlled of physician-directed versus respiratory therapy consult service directed respiratory care to adult non-ICU inpatients. Am J Respir Crit Care Med. 1998;158:1068-1075.
3. Lie RK. The ethics of the physician-patient relationship. Ethical Perspect. 1997;4:263-270.
4. Kayabaşı S, Gül F. Kulak Burun Boğaz hekimlerine yapılan konsültasyon nedenleri ve sonuçları: Retrospektif bir analiz. Harran Unıv Tıp Fak Derg. 2019;16:143-147.
5. Işıl C, Türk Ş, Sayın P, Çınar S, Oba S. Hastanemiz yoğun bakım ünitesinden acil konsültasyon istemlerinin değerlendirilmesi. Med Bull Sisli Etfal Hosp 2012;46:49-52.

6. Özkur E, Altunay İ, Şekerlisoy G, Erdem Y. 3. Basamak bir hastanenin acil servisindeki dermatoloji konsültasyonlarının değerlendirilmesi. Med Bull Sisli Etfal Hosp 2020;54:197–200
7. Peksöz R, Bayar, B. Türkiyenin doğusunda II. basamak bir devlet hastanesinin acil genel cerrahi hasta profili. Euroasia. App. Sci. 2020;7:47–54.
8. Larson DB, Johnson LW, Schnell BM, Salisbury SR, Forman HP. National trends in CT use in the emergency department: 1995–2007. Radiology 2010;258:164–73.
9. Korley FK, Pham JC, Kirsch TD. Use of advanced radiology during visits to US emergency departments for injury-related conditions, 1998–2007. JAMA 2010;304:1465–71.
10. Dick EA, Varma D, Kashef E, Curtis J. Use of advanced imaging techniques during visits to emergency departments--implications, costs, patient benefits/risks. Br J Radiol. 2016;89:20150819.
11. Fiorentino M, Mulles S, Cue L, Merchant AM, Tufariello A, Cummings D et al. High acuity of postoperative consults to emergency general surgery at an urban safety net hospital. J Surg Res. 2021;257:50-55.
12. Çobanoğlu U. Bir üniversite hastanesinde göğüs cerrahisi konsültasyonu yapılan olguların değerlendirilmesi. Türk Toraks Dergisi 2009;10:117-121.
13. Brenner DJ, Hall EJ. Computed tomography–an increasing source of radiation exposure. NEJM 2007;357:2277–84.
14. Fazel R, Krumholz HM, Wang Y, Ross JS, Chen J, Ting HH, et al. Exposure to low-dose ionizing radiation from medical imaging procedures. N Engl J Med 2009;361:849–57.
15. Toker A, Shvarts S, Perry ZH. et al. Clinical guidelines, defensive medicine, and the physician between the two. Am J Otolaryngol. 2004;**25**:245–250.
16. Corrigan J, Wagner J, Wolfe L. et al. Report from congress medical malpractice reform and defensive medicine. *Cancer Invest.* 1996;**14**:277–284.
17. Ortashi O, Virdee J, Hassan R, Mutrynowski T, Abu-Zidan F. The practice of defensive medicine among hospital doctors in the United Kingdom. *BMC Med Ethics*. 2013;14:42.
18. Sethi MK, Obremskey WT, Natividad H, Mir HR, Jahangir AA. Incidence and costs of defensive medicine among orthopedic surgeons in the United States: a national survey study. *Am J Orthop (Belle Mead NJ)*. 2012;41:69-73.
19. Egnew TR, Wilson HJ. Role modeling the doctor-patient relationship in the clinical curriculum. Fam Med 2011; 43: 99-104.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):42-45

Received: 11 October 2023
Revised: 11 December 2023
Acccepted: 13 December 2023
DOI: 10.47482/acmr.1374372

CASE REPORT

A new treatment modality for the treatment of unligated thoracic side branch of left internal mammary artery: Underexpanded stent

Uğur Küçük[1] **Bahadır Kırılmaz**[1] **Emine Gazi**[1] **Halil Fatih Aşgün**[2] **Uğur Özpınar**[1]

1 Çanakkale Onsekiz Mart University Faculty of Medicine, Department of Cardiology, Çanakkale, Turkey
2 Çanakkale Onsekiz Mart University Faculty of Medicine, Department of Cardiovascular Surgery, Çanakkale, Turkey

Abstract

The left internal mammary artery (LIMA) is often preferred in coronary artery bypass grafting (CABG). LIMA has additional features such as less fenestration in the endothelial layer, less intercellular permeability, anti-thrombotic activity, rapid lipolysis, and less lipid synthesis, resulting in an excellent long-term patency rate. LIMA side branches or anatomical variations that are not ligated intraoperatively may cause coronary ischemia in the postoperative period. Although various treatment modalities such as coiling, vascular plug embolization, and surgical ligation have been described in treating LIMA side branches, no studies show the superiority of one treatment modality over another. In this case, the advantages, disadvantages, and critical points affecting the success of unligated LIMA side branches treatment methods were discussed.

Keywords: CoronaryArtery Bypass, Stents, Internal Mammary-Coronary Artery, Anastomosis.

Cite this article as: *Küçük U, Kırılmaz B, Gazi E, Aşgün H F, Özpınar U. A new treatment modality for the treatment of unligated thoracic side branch of left internal mammary artery: Underexpanded stent. Arch Curr Med Res. 2024;5(1):42-45*

Corresponding Author:
Uğur Küçük, Çanakkale Onsekiz Mart University Faculty of Medicine, Department of Cardiology, Çanakkale, Turkey
E-Mail: drugurkucuk@hotmail.com

INTRODUCTION

In the world, coronary artery disease (CAD) is a leading cause of mortality and morbidity, as well as the most common cause of hospitalization (1). The coronary artery bypass graft (CABG) surgery is an effective method of revascularization in treating CAD (2). In patients who undergo CABG surgery, the duration of graft patency has an impact on both short and long-term cardiovascular outcomes. Considering the excellent long-term patency rate of the left internal mammary artery (LIMA) grafts in CABG treatment of coronary artery disease, the LIMA is often chosen over saphenous vein grafts (3). Our case relates to a patient who had a ligated 1st intercostal artery during CABG and had a side branch of the LIMA unligated as an anatomical variation. Several percutaneous treatment options have been reported for patients with objective myocardial ischemia due to open LIMA side branches, including vascular plugs, coils, and gel foam (4,5).

This case report aims to present a case in which an unligated LIMA side branch causing coronary ischemia was successfully occluded by the use of our stenting method implanted without optimal patency to prevent coronary ischemia from occurring.

CASE REPORT

Informed consent was obtained from the patient. A 41-year-old woman was operated 12 years ago for valvular pulmonary stenosis and had a coronary artery bypass surgery five years ago. The patient presented to our clinic with Canadian Cardiovascular Society Angina Grade 3 despite maximal antianginal therapy for the past month. There were no specific symptoms on physical examination. Electrocardiography (ECG) was in sinus rhythm with negative T waves in the anterior and inferior leads. Echocardiography revealed anteroseptum, apical septum, and apical hypokinesia, and the left ventricular ejection fraction was 45%. Myocardial perfusion scintigraphy revealed diffuse ischemia in the anterior wall, and coronary angiography was performed. Coronary angiography showed that patency of the left anterior descending (LAD)-LIMA anastomosis was patent but the unligated LIMA side branch was causing coronary steal syndrome (Figure 1). No severe lesions or anastomosis were ascertained in the left circumflex or right coronary arteries. The patient was evaluated by cardiology and cardiovascular surgery. It was decided to occlude the non-ligated LIMA side branch. A Judkins right coronary catheter (JR) through a 6-French (F) sheath from the right femoral artery was selectively inserted into the LIMA. The LIMA side branch was crossed using a 0.014 floppy wire. A 2.25 x 20 mm diameter drug-eluting coronary stent was first implanted in the mid-side branch at 5 atm pressure (Figure 2a). Then, a 2.5 x 9 mm bare metal coronary stent was implanted into the stent at 5 atm pressure to include the proximal part of the stent (Figure 2b). The procedure was terminated before the stents were fully dilated (Figure 2c).

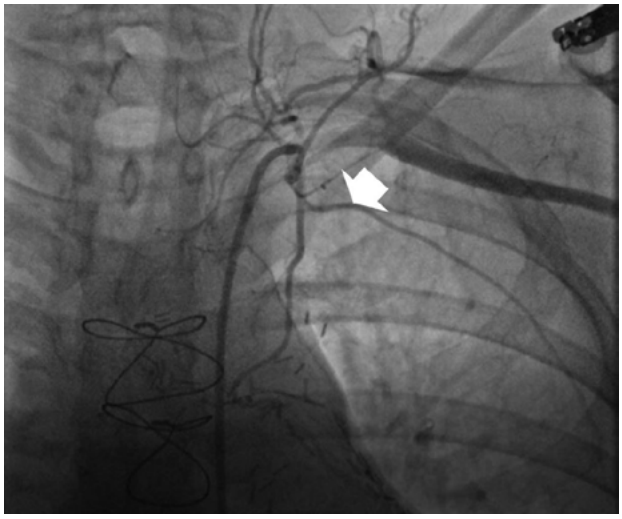


Figure 1. Unligated side branch originating from the left internal mammary artery

Following stent implantation, the patient with no chest pain or no change in ECG was transferred to the coronary intensive care unit for follow-up. During stent implantation, the patient was given unfractionated heparin and acetylsalicylic acid. No clopidogrel or any other antiplatelet drug was given. After 24 hours of follow-up, instead of dual antiplatelet treatment, only acetylsalicylic acid was prescribed, and the patient was discharged. At the 1-month follow-up visit, control CAG was performed, and the unligated LIMA side branch was completely occluded (Figure 2d).

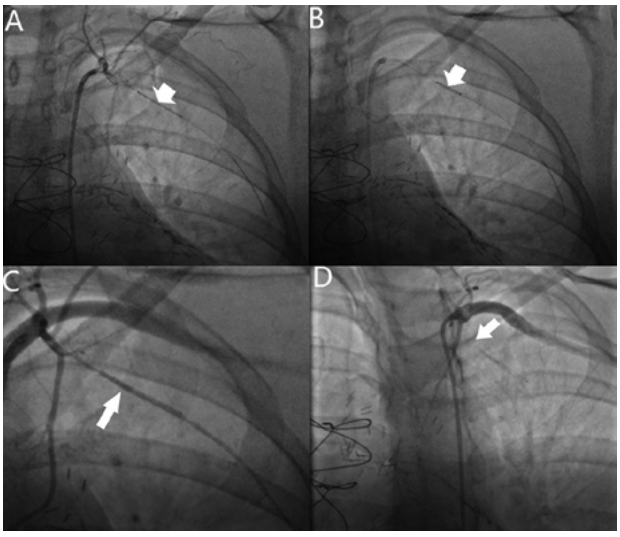


Figure 2. Percutaneous treatment of coronary steal syndrome

A. 2.25 x 20 mm diameter drug-eluting coronary stent was first implanted in the mid-side branch at 5 atm pressure

B. 2.5 x 9 mm bare metal coronary stent was implanted into the stent at 5 atm pressure to include the proximal part of the stent

C. The procedure showing incomplete stenting to the unligated LIMA side branches arteries was terminated.

D. Total occlusion of unligated LIMA side branches arteries was observed in angiography 1 month later

DISCUSSION

CABG is the most frequently performed major cardiac surgery in coronary revascularization treatment. LIMA is used in 81% of coronary revascularization procedures (6). LIMA graft failure is rare in the early period and is frequently caused by hematoma, dissection, and stenosis at the anastomosis site (7). It is unclear when sensitive plaques can cause acute coronary syndrome (8). One cause of long-term LIMA graft failure is an unligated LIMA side branch. While the thin caliber branches of the LIMA, such as the sternal and intercostal branches do not cause ischemia most of the time, the low resistance of the side branch, such as the lateral internal thoracic artery compared to the LIMA may cause blood to be directed to the low-resistance side branch and cause ischemia (9).

There is no definite guideline recommendation on treating unligated LIMA side branches. LIMA side branches may not always cause myocardial damage. Therefore, further examinations are required to test for myocardial ischemia in such patients. In a study consisting of 38 cases, the benefit of working with a myocardial scintigraphy test was demonstrated. As in our case, ischemia of LIMA side branches is mostly seen in myocardial perfusion scintigraphy in the literature (10). In another literature case example, one case was closed with Amplatzer Vascular Plug. In particular, vascular plug embolization is a therapeutic choice for medium to large vessels, whereas coils are more commonly used for small vessels (11). A LIMA side branch of appropriate diameter is required for the vascular plug, otherwise, problems such as device embolization may occur. Even though coil application is frequently preferred, it has a spiral structure and can easily take a curved shape in aneurysmal lesions; it may not take a spiral shape in regular vessels as in our case. Another alternative treatment method is graft stents, which have high success rates, but there is no follow-up data since restenosis is a serious problem (12).

Informed Consent: Informed consent was obtained from the patient.

Declarations

This study was presented as a 'poster presentation' at the 18th International Congress of Update in Cardiology and Cardiovascular Surgery on 1–4 December 2022 in Antalya, Turkey. The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest.

REFERENCES

1. Ties D, van Dorp P, Pundziute G, Lipsic E, van der Aalst CM, Oudkerk M, et al. Multi-Modality imaging for prevention of coronary artery disease and myocardial Infarction in the general population: Ready for prime time? J Clin Med. 2022;11(11):2965.
2. Halabi AR, Alexander JH, Shaw LK, Lorenz TJ, Liao L, Kong DF et al. Relation of early saphenous vein graft failure to outcomes following coronary artery bypass surgery. Am J Cardiol. 2005;96(9):1254-9.
3. Guzon OJ, Klatte K, Moyer A, Khoukaz S, Kern MJ. Fallacy of thoracic side-branch steal from the internal mammary artery: analysis of left internal mammary artery coronary flow during thoracic side-branch occlusion with pharmacologic and exercise-induced hyperemia. Catheter Cardiovasc Interv. 2004;61(1):20-8.

4. Weinberg N, French WJ, Shavelle DM. Use of the Amplatzer Vascular Plug for treatment of coronary steal. Int J Cardiol. 2008;124(1):109-11.
5. Akilli A, Duygu H, Erturk U, Yildiz A, Zoghi M, Ozerkan F. Transbrachial coil occlusion of unligated thoracic side branch of arterial graft of internal mammary artery leading to silent ischemia in a diabetic patient. Int J Cardiol. 2006;113(1):16-8.
6. Cleveland JC Jr, Shroyer AL, Chen AY, Peterson E, Grover FL. Off-pump coronary artery bypass grafting decreases risk-adjusted mortality and morbidity. Ann Thorac Surg. 2001; 72(4):1282-1289.
7. Nakamura T, Yamamoto S, Funayama H, Mitsuhashi T, Momomura SI. Acute occlusion of the left internal mammary artery graft in the late postoperative period. J Cardiol Cases. 2014; 10(2):51-53.
8. Keskin K, Yıldız SS, Çetinkal G, Kilci H, Çalışkan N, Keskin EB, et al. The Association of Plasma Apelin Levels with Plaque Vulnerability. Sisli Etfal Hastan Tip Bul. 2019;53(3):267-271.
9. Singh RN, Sosa JA. Internal mammary artery--coronary artery anastomosis. Influence of the side branches on surgical result. J Thorac Cardiovasc Surg. 1981;82(6):909-14.
10. Biceroglu S, Karaca M, Yildiz A, Ildizli Demirbas M, Yilmaz H. Can left internal mammary artery side branches affect blood flow rate? Cardiovasc J Afr. 2009;20(2):119-21.
11. Yorgun H, Canpolat U, Kaya EB, Çil B, Aytemir K, Oto A. The use of Amplatzer Vascular Plug(®) to treat coronary steal due to unligated thoracic side branch of left internal mammary artery: four year follow-up results. Cardiol J. 2012;19(2):197-200.
12. Gercken U, Lansky AJ, Buellesfeld L, Desai K, Badereldin M, Mueller R, et al. Results of the Jostent coronary stent graft implantation in various clinical settings: procedural and follow-up results. Catheter Cardiovasc Interv. 2002;56(3):353-360.

Archives of Current Medical Research
Arch Curr Med Res 2024;5(1):46-49

Received: 16 August 2023
Revised: 06 November 2023
Accepted: 13 November 2023
DOI: 10.47482/acmr.1343863

CASE REPORT

Can we medically follow coronary artery aneurysms?; A case report

Ali Duygu[1] **Uğur Küçük**[2]

1 Yenişehir State Hospital, Department of Cardiology, Bursa, Turkey
2 Çanakkale Onsekiz Mart University, Department of Cardiology, Çanakkale, Turkey

Abstract

Coronary artery aneurysm (CAA) is an enlargement of the coronary vascular lumen that can't be fixed and is at least 1.5 times the diameter of the normal coronary segment next to or connected to it. They are usually asymptomatic; their clinical presentation ranges from incidental findings on cardiac imaging to myocardial infarction (MI), and they may result in angina, MI, and sudden death, especially when they are very large. An aneurysm was seen in the middle segment of the left anterior descending artery (LAD) in the images obtained from the patient. After the council, coronary artery bypass grafting (CABG) was decided due to the risk of rupture, but the patient and his relatives did not accept the operation. In outpatient clinic visits every 3 months for 9 months, it was observed that her complaints regressed with medical treatment. There is still no clear treatment approach for CAAs and CABG, and percutaneous coronary intervention (PCI) may be preferred or medical therapy may be used.

Keywords: Coronary Artery Aneurysm, Aneurysmal Coronary Artery Disease, Left Anterior Descending Artery.

Cite this article as: *Duygu A, Küçük U. Can we medically follow coronary artery aneurysms?; A case report. Arch Curr Med Res. 2024;5(1):46-49*

Corresponding Author:
Ali Duygu, Department of Cardiology, Yenişehir State Hospital, Bursa, Turkey
E-Mail: ali.duygu1989@gmail.com

INTRODUCTION

Aneurysmal coronary artery disease (ACAD) is divided into coronary artery aneurysm (CAA) and coronary aneurysmal ectasia (CAE). CAA is when the coronary artery lumen gets ≥ 1.5 times wider in one spot than the adjacent or contiguous normal coronary segment. This widening can't be fixed. CAA is found in 5% of patients undergoing CAG (2). CAA is most commonly observed in the right coronary artery (RCA) with a frequency of 40%, followed by the left anterior descending artery (LAD) with a frequency of 32% (3). CAAs are usually asymptomatic; their clinical presentation ranges from incidental findings on cardiac imaging to myocardial infarction (MI) and may result in angina, MI, and sudden death, especially when very large (4). Treatment options include medical and surgical excision, coronary artery bypass grafting (CABG), and percutaneous coronary intervention (PCI). However, in the absence of randomized trials or guideline recommendations, the treatment of these patients creates clinical uncertainty for the clinician (5).

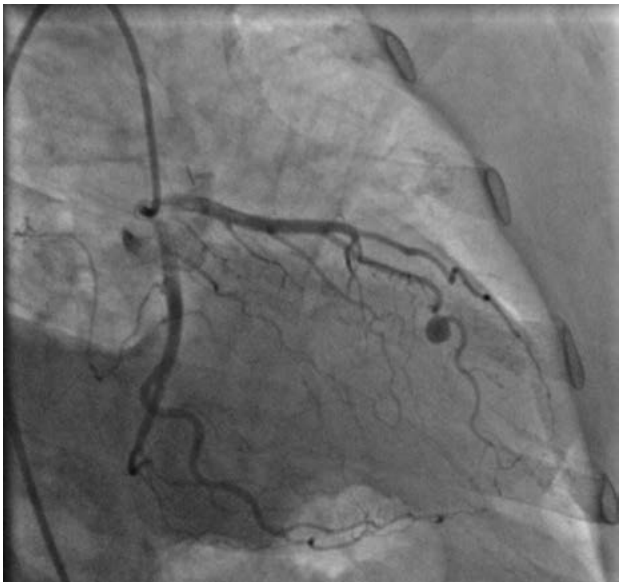
We aimed to contribute to the approach to CAA, a disease for which a clear treatment algorithm has not yet been established, with a case from our clinic.

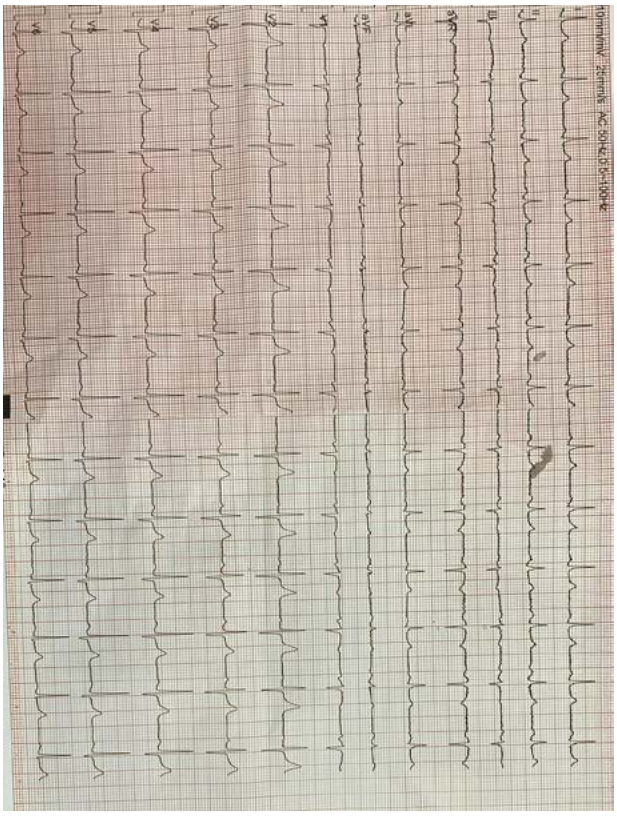
CASE REPORT

A 52-year-old woman presented to the emergency department with chest pain and was admitted to the coronary intensive care unit with Canadian Cardiovascular Society Angina Grade 3 angina. In the anamnesis of the patient, it was learned that she had no history of Kawasaki disease or any other connective tissue disease and no history of CAG or PCI, but she had active breast malignancy and was receiving chemotherapy. Precordial auscultation and physical examination findings were normal; heart rate was 76 beats/min (Figure 1). After admission to the intensive care unit, acetylsalicylic acid 100 mg, clopidogrel 75 mg, atorvastatin 40 mg, metoprolol 50 mg, and silazapril 5 mg were initiated. Biochemical parameters determined from blood samples obtained from the proximal vein of the upper extremity were urea 23 mg/dl, creatinine 1.18 mg/dl, alanine aminotransferase (ALT) 26 U/L, aspartate transferase (AST) 30 U/L, sodium 135 mmol/L, potassium 4.5 mmol/L, albumin 4.3 g/dl, and glucose 87 mg/dl. On the hemogram, white blood cell (WBC) was 6.92 x 10 3 /uL, hemoglobin (Hb) was 11.7 g/dl, platelet (PLT) was 218 x 10 3 /uL, neutrophil (NEU) was 5 x 10 3 /uL, and lymphocyte (LYM) was 1.53 x 10 3 /uL. On transthoracic echocardiographic imaging, the left ventricular ejection fraction (LVEF) was 50% and the left atrial diameter was 30 mm. After premedication, the patient was taken to the catheterization laboratory, and a Judkins left coronary catheter (JL) was selectively inserted into the LIMA through a 6-French (F) sheath from the right femoral artery. The images obtained showed an aneurysm in the middle segment of the LAD (Figure 2), and the right coronary artery (RCA) was observed to be normal (Figure 3). After the council, CABG was decided due to the risk of rupture, but the patient and his relatives did not accept the operation. Spironolactone/hydrocortiazide was added to the existing treatment, and the patient was transferred to the ward. The patient had no complaints in the ward follow-up; medical treatment was organized, and he was discharged. In outpatient clinic visits every 3 months for 9 months, it was observed that her complaints regressed with medical treatment.

DISCUSSION

The majority of reported cases have had CAG and computed tomography diagnoses because CAAs are typically clinically silent and incidentally seen on cardiac examinations. Having obstructive atherosclerotic disease at the same time, on the other hand, can cause both exertional angina and acute coronary syndrome. Similarly, thrombosis in the lumen of large aneurysms can cause distal embolization and MI. In our case, CAA presented clinically as class 3 angina, and an aneurysm in the middle segment of the LAD was detected by CAG.





In adults, CAA is predominantly of atherosclerotic origin; however, other causes include Kawasaki disease, autoimmune diseases, trauma, infections, dissection, congenital malformation, and angioplasty (7). Our patient did not have any of the existing etiologic factors but was under chemotherapy treatment for breast cancer. Due to the uncertainty of etiologic factors, a treatment method for incidentally found CAAs has not yet been established. For patients with angina or an acute MI who need intervention for aneurysmal coronary artery disease, both percutaneous and surgical revascularization come with technical challenges. In addition, most published studies have evaluated the results of PCI in symptomatic patients presenting with acute MI, whereas the results of PCI in asymptomatic patients with CAA are limited to small case series (8). Also, PCI of the aneurysmal or ectatic culprit vessel in people who have had an acute MI is linked to lower procedural success and a higher rate of no-reflow and distal embolization (9). In addition, patients who survived acute MI after PCI of an aneurysmal vessel had higher mortality and higher rates of stent thrombosis during follow-up (10). The ideal surgical approach is not yet available. However, the most common surgical practice is to open the CAA, suture its afferent and efferent vessels, and finish with bypass grafting if necessary (11). Although the medical treatment approach is mostly preferred in asymptomatic patients, there are no studies with an optimal outcome yet. However, the higher rates of death and cardiovascular events in two separate studies with 5-year and 49-month follow-ups in which these patients were compared with the normal population suggest that the medical treatment approach should be considered as an option (12, 13). Our patient was discharged with ACEI, spironolactone, and antiplatelet treatment, and her complaints regressed.

As a result, there is still no clear treatment approach for CAAs; CABG and PCI may be preferred, but it should be kept in mind that they can also be followed with medical treatment. Our knowledge on this subject will become more clear with future studies.

Informed Consent: Informed consent was obtained from the patient.

Declarations

The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest.

REFERENCES

1. El Guindy MS, El Guindy AM. Aneurysmal coronary artery disease: an overview. Glob Cardiol Sci Pract 2017; e201726.
2. Swaye PS, Fisher LD, Litwin P, Vignola PA, Judkins MP, Kemp HG, et al. Aneurysmal coronary artery disease. Circulation. 1983;67(1):134-8.
3. Takahashi K, Oharaseki T, Naoe S, Wakayama M, Yokouchi Y. Neutrophilic involvement in the damage to coronary arteries in acute stage of Kawasaki disease. Pediatr. Int. 2005;47:305-10
4. Collins MJ, Borges AJ, Singh G, Pillai JB, David TE, Leong SW, et al. A giant coronary artery aneurysm in the right coronary artery. Cardiovasc Pathol 2006;15(3):150–2

5. Kawsara A, Núñez Gil IJ, Alqahtani F, Moreland J, Rihal CS, Alkhouli M. Management of Coronary Artery Aneurysms. JACC Cardiovasc Interv. 2018;11(13):1211-1223.
6. Chrissoheris MP, Donohue TJ, Young RS, Ghantous A. Coronary artery aneurysms. Cardiol Rev. 2008;16(3):116-23.
7. Morita H, Ozawa H, Yamazaki S, Yamauchi Y, Tsuji M, Katsumata T, et al. A case of giant coronary artery aneurysm with fistulous connection to the pulmonary artery: a case report and review of the literature. Intern Med. 2012;51(11):1361-6.
8. Núñez-Gil IJ, Terol B, Feltes G, Nombela-Franco L, Salinas P, Escaned J, et al. Coronary aneurysms in the acute patient: Incidence, characterization and long-term management results. Cardiovasc Revasc Med. 2018;19(5 Pt B):589-596.
9. Ipek G, Gungor B, Karatas MB, Onuk T, Keskin M, Tanik O, et al. Risk factors and outcomes in patients with ectatic infarct-related artery who underwent primary percutaneous coronary intervention after ST elevated myocardial infarction. Catheter Cardiovasc Interv. 2016;88(5):748-753.
10. Iannopollo G, Ferlini M, Koziński M, Ormezzano MF, Crimi G, Lanfranchi L, et al. Patient outcomes with STEMI caused by aneurysmal coronary artery disease and treated with primary PCI. J Am Coll Cardiol. 2017;69(24):3006-3007.
11. Izumi K, Hisata Y, Hazam S. Surgical repair for a coronary-pulmonary artery fistula with a saccular aneurysm of the coronary artery. Ann Thorac Cardiovasc Surg. 2009;15(3):194-7.
12. Baman TS, Cole JH, Devireddy CM, Sperling LS. Risk factors and outcomes in patients with coronary artery aneurysms. Am J Cardiol. 2004;93(12):1549-51.
13. Warisawa T, Naganuma T, Tomizawa N, Fujino Y, Ishiguro H, Tahara S, et al. High prevalence of coronary artery events and non-coronary events in patients with coronary artery aneurysm in the observational group. Int J Cardiol Heart Vasc. 2015;10:29-31.

ARCHIVES OF
CURRENT MEDICAL
RESEARCH

www.acmronline.org

https://dergipark.org.tr/tr/pub/acmr