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Clinical Process and Nursing Management in Endoscopic Retrograde Cholangiopancreatography Procedures

Endoskopik Retrograd Kolanjiyopankreatografi İşlemlerinde Klinik Süreç ve Hemşirelik Yönetimi

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Abstract: Endoscopic retrograde cholangiopancreatography (ERCP) is an endoscopic technique used in the diagnosis/treatment of bile duct and pancreatic diseases using side-view endoscopy and fluoroscopy. With a morbidity rate of 5-10% and a mortality rate of 0.1-1%, ERCP is considered one of the most technically challenging procedures. Post-ERCP pancreatitis is considered the most common complication associated with the procedure, with an incidence ranging from 3.5% to 9.7%. Other complications, which are less frequent than post-ERCP pancreatitis, include cholangitis, bleeding, perforation, hypoxemia, and cholecystitis. Careful preparation before the procedure, monitoring during the procedure, and nursing care after the procedure are of great importance in the early detection of these adverse events and in minimizing the risk of complications. The ERCP procedure is based on a multidisciplinary approach that requires the collaboration of the physician, nurse, and anesthesia team. Nurses are responsible for educating the patient and family before ERCP, tracking laboratory and radiological tests, and preparing the unit; for monitoring the patient during the procedure, positioning, and coordinating with the physician; and, after the procedure, for closely monitoring the patient's vital signs and complications as well as providing discharge education. The aim of this review is to address current approaches to the nurse's role throughout all processes of endoscopic retrograde cholangiopancreatography, based on a review of the literature. According to findings obtained from the literature, patient education, teamwork, and patient monitoring are emphasized as critical for the prevention of complications and the success of treatment.
Keywords: Endoscopic retrograde cholangiopancreatography, Nursing, Patient care

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Özet: Endoskopik retrograd kolanjiyopankreatografi (ERCP), safra yolu ve pankreas hastalıklarının yan görüşlü endoskopi ve floroskopi kullanılarak tanı/tedavisinde kullanılan endoskopik bir tekniktir. %5-10 morbidite ve %0,1-1 mortalite oranıyla ERCP, teknik olarak zorlu işlemlerden biri olarak kabul edilir. ERCP sonrası pankreatit, işlemle ilişkili en sık görülen komplikasyon olarak kabul edilir ve görülme sıklığı %3,5 ile %9,7 arasında değişir. ERCP sonrası pankreatitten daha az sıklıkta görülen diğer komplikasyonlar arasında kolanjit, kanama, perforasyon, hipoksemi ve kolesistit yer alır. Bu istenmeyen olayların erken saptanması ve komplikasyon riskinin en aza indirilmesinde işlem öncesi dikkatli hazırlık, işlem sırasında takip ve işlem sonrası hemşirelik bakımı büyük önem taşımaktadır. ERCP işlemi hekim, hemşire ve anestezi ekibinin işbirliğini gerektiren multidisipliner bir yaklaşıma dayanmaktadır. Hemşireler, ERCP öncesinde hasta ve ailesini eğitmek, laboratuar ve radyolojik testleri takip etmek ve üniteyi hazırlamak; işlem sırasında hastayı izlemek, pozisyonlandırmak ve hekimle koordinasyonu sağlamak; işlem sonrasında hastanın vital bulgularını ve komplikasyonlarını yakından izlemek ve taburculuk eğitimi vermekten sorumludur. Bu derlemenin amacı, literatür taramasına dayanarak, endoskopik retrograd kolanjiyopankreatografinin tüm süreçlerinde hemşirenin rolüne ilişkin güncel yaklaşımları ele almaktır. Literatürden elde edilen bulgular komplikasyonların önlenmesi ve tedavinin başarısı için hasta eğitimi, ekip çalışması ve hasta takibinin kritik öneme sahip olduğu vurgulanmaktadır.
Anahtar Kelimeler: Endoskopik retrograd kolanjiyopankreatografi, Hemşirelik, Hasta bakımı

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Endoscopic retrograde cholangiopancreatography (ERCP) is the process of radiologically imaging the hepatobiliary tree and pancreatic duct after cannulation of the Papilla of Vater (1). The first ERCP procedure in the world was performed in 1968 in the United States by McCune and his colleagues. In those years, effective methods such as ultrasonography, computed tomography, and magnetic resonance had not yet been used for the diagnosis of pancreatic diseases. Only direct abdominal X-rays, scintigraphy, and pancreatic function tests were being used, and these were insufficient for diagnosis (2). Following studies conducted on dogs, McCune et al. attempted to reach the papilla of Vater and cannulate the papilla via the oral route using a fiber optic duodenoscope in volunteer patients who had undergone open cholecystectomy. Following these attempts, the ERCP procedure was performed for the first time. (3). The first applications of ERCP in our country were performed in 1976 by Ökten et al. at the Ankara University Faculty of Medicine and by Şahin et al. At the Türkiye Yüksek İhtisas University Hospital. Since the 1980s, treatments using ERCP have been increasingly applied. (4,5).

1. ERCP Room

The ERCP room may vary depending on the conditions of the centre where the procedure is performed. Smaller centres with a low ERCP volume typically perform the procedure in the radiology department/operating theatre, while most centres with a high ERCP volume perform the procedure in rooms specially designed for the procedure within the endoscopy unit. A basic ERCP room requires standard endoscopic equipment as well as a high-quality fluoroscopy unit with fixed imaging capabilities.

The ERCP room should preferably have two doors: one for the entry and exit of patients, doctors and other staff, and the other for bringing endoscopes from the cleaning room and taking them to the washing room after the procedure. The patient entry and exit door should be wide enough (at least 130 cm) to accommodate a stretcher and bed. If separate storage areas are available, 25-30 m² may be sufficient for the endoscopy room area. If there is no separate storage area in the endoscopy unit, 35 m² is preferred for the ERCP room.

The primary objective is to achieve cannulation of the desired ductal system through endoscopic visualisation of the ampulla and high-quality radiographic imaging to guide appropriate treatment. In most cases, basic equipment is sufficient for stone removal or stent placement in uncomplicated strictures. A mobile or fixed C-arm system is used to adjust the imaging plane to enable viewing of the biliary tree from different angles and to visualise the bifurcation and main duct branches.

The ERCP procedure generally requires a team consisting of a physician and at least two assistants. The first assistant (nurse or technician) stands immediately beside the physician, assisting them with the use of guide wires and other accessories. Anaesthesia personnel or a sedation nurse is positioned at the patient's head and closely monitors the patient throughout the procedure, administering the necessary sedation/anaesthesia. The second assistant plays a role in preparing the equipment. In some centres, a radiology technician may also be present to operate the radiographic equipment (2,6).

In endoscopy rooms, it is preferable for monitors to be suspended from the ceiling to provide uninterrupted viewing for the endoscopist, endoscopy assistant, nurse and any observers present. At least two monitors should be present for standard endoscopy, and their height should be adjusted to be at the upper three-quarters of the endoscopist's eye level. (7). If sedation is administered during endoscopy, the patient's heart rate, oxygen saturation, and blood pressure must be monitored using the necessary equipment.

The ERCP procedure room must have a central oxygen and suction system, as is the case in endoscopy rooms.

The procedure table in the ERCP room should be X-ray transparent, capable of vertical and horizontal movement, and positioned in the centre of the room. As there will be at least two assistant nurses monitoring vital signs and assisting the endoscopist during the procedure, it would be appropriate to position the endoscopic monitors in two different locations (2).

2. ERCP and Radiology

As ERCP is an endoscopic and fluoroscopic procedure, the angiography system used by radiologists in hospitals is also used for ERCP. The angiography table includes C-arm units carrying tubes and image detectors, image monitors, and control systems. The table should be 240-280 cm long and 40-55 cm wide. It should be constructed of X-ray-transparent carbon fibre and be capable of supporting a patient weighing 250 kg. At one end of

the C-arm is the tube, and at the opposite end are the image intensifiers and flat panels containing the X-ray receptors.

2.1. Considerations for Radiation Safety

Personnel working in the ERCP room are exposed to high doses of radiation. To reduce radiation exposure, radiation workers (doctors, nurses and technicians) working in the controlled area must have received radiation safety training and pay the utmost attention to safety rules. For this purpose, lead aprons, thyroid protectors, lead glasses, lead screens, and lead glass screens are used. Necessary protective measures for the environment must be taken by covering the walls and doors surrounding the device with lead plates at least 2 mm thick and 2 m high from the floor. The irradiation time is related to the radiation dose received. Fluoroscopy should not be used during the procedure unless necessary. All personnel working in the ERCP room are considered radiation workers and use dose measurement devices. In our country, these devices are periodically inspected by the Turkish Energy, Nuclear and Mining Research Institute. The relevant regulation states that the effective dose of radiation exposure to workers should not exceed 50 mSv in any one year and an average of 20 mSv for five consecutive years. In addition, radiation workers undergo skin, eye, and haematological examinations every six months and annually. (2,8).

3. Endoscopes and Accessories Used in ERCP

Successful ERCP, the procedure of choice for treating patients with various pancreaticobiliary disorders, depends largely on the endoscopist's skills, appropriate patient selection, and a functional ERCP unit. A duodenoscope, various ancillary devices, and accessories are also required for successful surgery. A wider range of ERCP accessories has been developed to meet the increasing demands of therapeutic ERCP.

3.1. Side-view Endoscopes

Modern duodenoscopes, routinely used in ERCP procedures for diagnosis and treatment, are side-viewing video endoscopes equipped with an elevator. The elevator facilitates papillary cannulation and the placement of accessories, while the wide working channels (4.2 and 4.8 mm) of therapeutic duodenoscopes allow the passage of large-bore accessories (10 to 11.5 Fr) (2). Standard ERCP procedures utilise duodenoscopes; however, in patients with surgically altered anatomy (e.g., gastrectomy with Roux-en-Y anatomy, hepaticojejunostomy), upper endoscopes, colonoscopes, and enteroscopes are employed. Standard duodenoscopes are reusable. Rare cases of multidrug-resistant bacteraemia associated with contaminated duodenoscopes have been reported. To eliminate this risk, reusable duodenoscopes began to be manufactured in late 2019 (6,9).

Figures 1 and 2. Duodenoscope and close-up view

3.2. Accessories

A successful diagnostic/therapeutic ERCP requires cannulation of the target duct. Various devices are available to provide duct access. Accessories that facilitate endoscopists' diagnostic and therapeutic interventions include instruments or pharmacological agents (10). In particular, the use of sphincterotomes/guide wires and pre-cut sphincterotomes has increased the ability to perform deep cannulation of the desired canal. Accessories used for therapeutic purposes;

- ERCP catheter
- Sphincterotom
- Guide wire

- Balloon and basket for stone extraction
- Mechanical lithotripter
- Plastic and self-expanding metal biliary stents (for drainage purposes), pancreatic (plastic) stents, nasobiliary and nasopancreatic drains
- Dilatation balloon and catheter
- Tissue sampling accessories (cytology brush, biopsy forceps and aspiration needle)
- Polypectomy snare for stent removal, foreign body forceps, special stent extractor

ERCP catheter: Standard ERCP cannulas are 5 to 7 Fr catheters capable of accommodating guide wires up to 0.035 inches in diameter. They may be straight, tapered, or rounded at the tip.

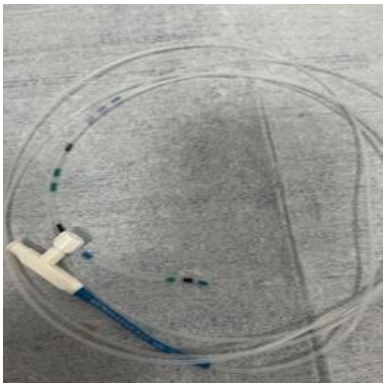


Figure 3. ERCP catheter

Guide wires: Guide wires are the cornerstone of diagnostic and therapeutic ERCP. They are used in cannulation, passing through strictures, entering the target duct, maintaining position within the target duct, and passing numerous accessories over them. Generally, there are three guide wire designs available for ERCP procedures: 1) Monofilament wires are designed for rigidity and are made of stainless steel. 2) Coiled wires are rigid and flexible, featuring a stainless steel inner monofilament core and an outer spiral coil. The inner core and outer spiral coil design provides rigidity and flexibility, respectively. 3) Coated or sheathed wires have a monofilament core made of stainless steel or nitinol and an outer sheath made of Teflon, polyurethane, or another lubricious polymer. Guide wires are advanced under fluoroscopic guidance via a catheter or sphincterotome, which provides rigidity and direction. Their diameters range from 0.018 to 0.035 inches, and their lengths typically vary between 260 and 480 cm. (7).

Sphincterotomes: Pull-type (Erlangen) sphincterotomes are designed for bile duct sphincterotomy. They consist of a Teflon catheter containing a continuous wire loop with an open wire 20 to 30 mm in length extending at a variable distance from the tip. Due to both their higher cannulation rate compared to standard ERCP catheters and the fact that sphincterotomy is performed in the vast majority of ERCPs, sphincterotomes have become the primary biliary cannulation device during ERCP in patients with normal anatomy and intact papilla.

Sphincterotomes are available with single, double, and triple lumens. However, triple-lumen devices are commonly used in ERCP units today. Triple-lumen sphincterotomes allow for contrast injection without the need to remove the wire, as they feature an additional port.

Figure 4. Sphincterotomy

Stents: Plastic stents are made of polyethylene or Teflon and are available in various sizes, shapes and lengths for bile duct and pancreatic pathologies. A push tube is used to place plastic stents onto a guide wire with or without an internal guide catheter. Carrier systems that combine push tubes and guide catheters for plastic stents are available.

Self-expanding metal stents (SEMS) have been introduced to extend stent patency compared to plastic stents. SEMS are available in sizes up to 8 to 10 mm in diameter, either bare-metal, partially covered, or fully covered. Most SEMS are made of stainless steel or nitinol, a nickel-titanium alloy that provides high flexibility and resistance to bending. SEMS are costly compared to plastic stents, but they can generally be cost-effective, particularly in malignant diseases, as they reduce the need for reintervention by providing a longer stent lumen (6).

Figure 5. Straight/double pigtail stents

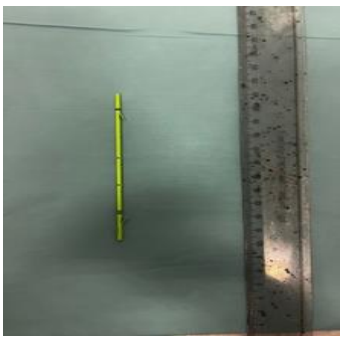


Figure 6. Pancreatic stent

Naso-biliary and pancreatic drainage catheters: Nazobiliary drainage catheters are used for the temporary drainage of bile ducts and are available as 250 cm long catheters with 5 to 9 side holes to facilitate drainage, in 5, 7 and 10 Fr diameters. Nasopancreatic drainage catheters are 5 Fr in diameter and can be used to drain the main pancreatic duct after pancreatic sphincterotomy or to flush and drain pancreatic fluid accumulations. Nasobiliary and nasopancreatic tubes are placed over a 0.035-inch guide wire. After the endoscope is removed from the patient, a nasal transfer tube is required to redirect the tube from the mouth to the nose.

Stenosis and papilla dilatation devices: Pancreaticobiliary dilatation can generally be performed using balloons or bougies. Dilatation balloons are made of non-flexible polyethylene and are available in diameters of 4, 6, 8 and 10 mm and lengths of 2 to 4 cm. The balloons are passed through a guide wire via the accessory channel of the endoscope. A radio-opaque band proximal to the conical portion indicates the maximum dilatation point. Papillary dilatation using large-diameter balloons (12 to 20 mm) is safe and effective in the treatment of choledocholithiasis when used in conjunction with biliary sphincterotomy.

Figure 7. Dilatation balloon

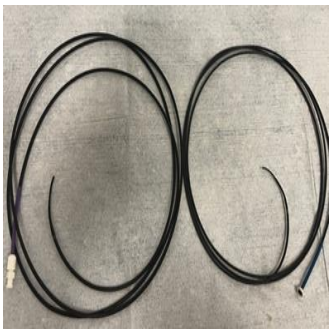


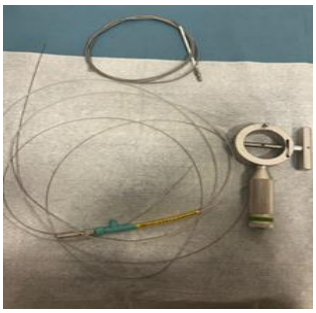
Figure 8. Bougie dilators of different sizes

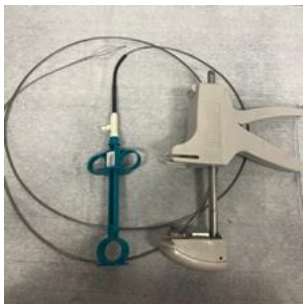
Stone removal accessories: Useful accessories for stone removal include double or triple lumen balloon catheters, wire baskets, and mechanical lithotripters. The stone removal balloon consists of a 5 to 6.8 Fr double or triple lumen catheter with a soft, flexible balloon at its tip (8 to 18 mm in diameter when inflated). Multi-sized stone removal balloons are available today. Before insertion into the endoscope, it is necessary to ensure that the balloon is properly inflated. The balloon catheter can be placed into the desired channel either over a guide wire or directly without a guide wire (6).

Stones can also be retrieved using wire baskets available in various sizes and configurations. The basket is designed to open like a trap to catch the stones. The function of the basket varies depending on the number of wires. Newly designed baskets allow the basket to reach difficult areas by advancing it over a guide wire. Trapezoidal baskets feature a handle that enables mechanical lithotripsy and an emergency release feature to prevent the basket from becoming stuck (6,11).

Figure 9. Stone extraction balloon catheter

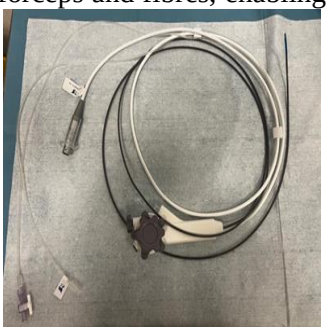
Mechanical Lithotripters: Lithotripsy wire baskets facilitate the removal of large (≥1.5 cm) bile duct stones by crushing them prior to extraction. The original Soehendra external lithotripter does not pass through the endoscope channel and requires cutting the basket handle and removing the endoscope before the stone is fragmented. This device consists of a 14 Fr metal sheath and a self-locking crank handle. The lithotripter can be used to break the stone in conjunction with most standard stone retrieval baskets or as a rescue device if the basket is impacted in the ampulla region where the impacted stone is located. Indeed, external lithotripters are most commonly used in this situation.

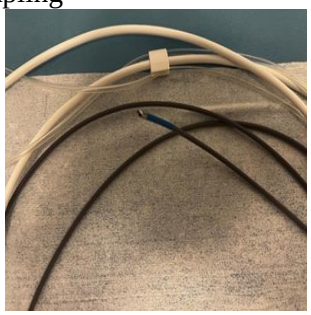




Figures 10 and 11. Mechanical lithotriptors and trapezoidal wire baskets

Cholangiopancreatoscopy: Duodenoscope-assisted cholangiopancreatoscopy enables direct visualisation of the bile and pancreatic ducts. Today, various electronic and fiber-optic miniscopes that can be passed through a therapeutic duodenoscope with a 4.2 mm channel are available for direct visualisation of the bile and pancreatic ducts. These devices are available in diameters of 10 mm or smaller. Their small working channel (1.2 mm) allows the passage of small forceps and fibres, enabling tissue sampling and laser and electrohydraulic lithotripsy (stone fragmentation) applications. Ultra-thin upper endoscopes with an outer diameter of 5 to 5.4 mm and a working channel of 2 mm are available and can be used for direct access to the bile or pancreatic duct after sphincterotomy or sphincteroplasty. This is called direct peroral cholangioscopy (or pancreatoscopy when used in the pancreatic duct) (6).





Figures 12 and 13. Cholangioscope and its movable tip

Use of carbon dioxide in ERCP: Gas embolisation is a rare but serious adverse event associated with ERCP. Risk factors include cholangioscopy, sphincterotomy, metallic stent placement, previous biliary surgery, transhepatic portosystemic shunts, pre-existing transhepatic drainage catheters, and transmural endoscopic necrosectomy. Using CO_2 insufflation instead of room air during ERCP is reasonable because CO_2 is absorbed more rapidly by tissues than room air, reducing the risk of gas embolisation. Although CO_2 embolisation has been reported, it appears to be well tolerated and is therefore preferred for insufflation during ERCP. Compared to air insufflation during ERCP, CO_2 insufflation causes less post-procedural tension and abdominal pain. (12–14).

4. Indications for ERCP

4. 1. Diagnostic indications

- Biliary or pancreatic diseases where other imaging methods are questionable or contraindicated
- Endoscopic ultrasound or biliary cytology

4. 2. Therapeutic indications

4.3. Biliary tract diseases:

- Removal of common bile duct stones
- Palliative treatment of malignant biliary obstruction
- Treatment of biliary fistula and surgical injury
- Dilatation of benign strictures
- Primary sclerosing cholangitis

4.4. Pancreatic diseases:

- Drainage of pancreatic pseudocysts and fistulas
- Removal of pancreatic stones (selected cases)

4.5. Contraindications

- Severe cardiopulmonary comorbidity
- Coagulopathy

4.6. Complications

- The 30-day mortality rate varies between 0.5-1% and occurs in 5-10% of cases.
- Bleeding after sphincterotomy
- Cholangitis (bile duct obstruction that cannot be resolved with ERCP)
- Bile stone impaction
- Acute pancreatitis
- Pseudocyst infection (15)

5. Nursing Approaches in ERCP

ERCP, which is both an endoscopic and radiological procedure, is a minimally invasive procedure that can involve various complications and, in rare cases, can result in mortality. Although ERCP is a highly effective method, it has the highest rate of adverse events among all commonly performed endoscopic procedures. Careful preparation prior to the procedure and close monitoring of patients afterwards are of paramount importance in minimising the risk of complications (16). The ERCP procedure requires meticulous work using delicate techniques by gastroenterologists and endoscopy nurses who have received training in this field (17). ERCP nurses are responsible for comprehensive patient care and technical knowledge of specialised equipment throughout the entire process, from the patient's admission to the hospital for the procedure to the discharge stage. Nurses require a combination of skills such as communication and critical thinking to ensure patient safety (18). Nurses play a critical role in this field, but rapid advances in endoscopic procedure technology require a higher level of professional expertise (19). Findings from previous ERCP procedures have demonstrated that scientific and effective nursing interventions are key to the safe and smooth implementation of the procedure (20).

5.1. Nurses' Responsibilities In Pre-Procedure Patient Preparation

Due to the minimally invasive nature of ERCP, patients often experience significant psychological stress reactions prior to the procedure due to psychological cognitive factors such as unfamiliarity with the procedure, perceived stress of the medical scenario, and expectations regarding pain tolerance. The combination of insufficient information and negative emotions reduces patients' compliance with and cooperation in treatment. It also causes a decrease in patients' immune function, negatively affecting their post-procedure recovery process (21,22). Therefore, patients undergoing ERCP should be fully informed about the benefits and risks of ERCP and whether there are any other options available (23). However, as most patients undergoing ERCP know very little about the

procedure, they tend to experience negative emotions during the perioperative period. Therefore, effective pre-procedure education for patients is crucial in reducing psychological pressure and improving their compliance (24).

The endoscopy nurse has important responsibilities in patient preparation, such as considering the patient's individual needs, reducing their anxiety and fears, and facilitating their participation in the treatment plan. Pre-procedure patient preparation depends on the patient's compliance with instructions regarding diet, medication use, smoking cessation, consent procedures, and laboratory and radiological examinations. Pre-procedure patient education is the cornerstone of effective healthcare; it can help patients manage their treatment, prevent avoidable complications and readmissions, and maintain or improve their quality of life (25).

In a study evaluating the effect of pre-procedure ERCP information on knowledge level and anxiety, patients scheduled for ERCP were divided into two groups: an education group and a control group. The education group received nursing instructions designed by the researcher, while the control group received routine patient care. The education included information about the definition, purpose, preparation instructions, complications, side effects, warning signs, and ERCP stents. Face-to-face education also used PowerPoint presentations and information brochures. The results of the study showed that the majority of participants had insufficient knowledge before the intervention, but after the intervention, more than two-thirds of the training group had more knowledge compared to the control group. It also reported that the training provided by nurses led to a decrease in the anxiety levels of patients undergoing ERCP (25). Another study conducted with elderly patients undergoing endoscopic procedures also reported that nursing intervention led to reductions in patients' stress, depression and anxiety levels (26).

All patients undergoing endoscopic procedures must undergo a pre-procedure assessment to evaluate their risks and help manage any issues related to their current medical condition. This assessment involves taking a history and performing a focused assessing cardiopulmonary status, physical examination, drug allergies, reviewing current medications, and evaluating the airway, particularly if deep sedation will be used. A gastroenterology nurse can assist with this assessment, but it is the clinician's responsibility to determine the patient's suitability for sedation. While assisting the clinician at this stage, the nurse should also inquire about the patient's history of tobacco, alcohol, and substance abuse, whether they are taking any herbal supplements, and, in female patients, their pregnancy status (foetal exposure to radiation). The patient should be informed that complications such as pancreatitis and sepsis may occur within 2-4 hours after the procedure, and that healthcare personnel should be notified immediately if symptoms such as tremors, hypothermia, hyperthermia, pain, vomiting, or tachycardia occur (27). As the ERCP procedure will be performed under anaesthesia, the anaesthetist's consultation and procedure consent forms must be checked (28). Informed consent should be obtained from the patient both verbally and in writing, and the patient and their relatives should be given education regarding discharge. (28,29).

5.2. Responsibilities of The Nurse Prior to ERCP

The patient's personal details, any chronic conditions, drug allergies and medications they are taking should be thoroughly investigated (28).

The patient should be fitted with a cap and dressed in a sterile gown (28). For ease of administration, the IV cannula should preferably be inserted into the patient's right arm. Antibiotics may be administered prior to the procedure, as prescribed by the physician. The IV cannula may be effective in preventing possible complications during sedation and for early intervention; if not necessary, it is recommended that it be removed after the procedure (16,30) .

The patient's fasting period (12 hours) must be monitored (28).

If barium/contrast procedures have been performed prior to ERCP, it must be confirmed through review of the patient's history and records that the barium/contrast medium has been completely eliminated from the gastrointestinal system (at least 72 hours) (27).

The patient's mouth should be checked to ensure that any dentures have been removed. It should be checked whether jewellery has been removed so as not to interfere with the radiological image (27,30). The presence of a pacemaker should be checked in case of potential use of a cautery device (28).

The patient should be monitored, and vital signs should be measured and recorded prior to the procedure (28).

As airway patency must be ensured, it should be checked whether there is any condition that would restrict neck and jaw mobility.

All controls, including the functionality of the lever function on the endoscope, must be ensured.

Care should be taken to ensure the patient's safety during the procedure, as there is a possibility that they may move their limbs.

The patient should be informed that they will need to lie face down or on their left side during the procedure.

Unless contraindicated and with the physician's knowledge, indomethacin suppositories should be administered rectally as routine immediately before the procedure (31).

Syringes should be prepared with radiocontrast medium free of air and labelled appropriately according to the contrast medium concentration. Syringes should be prepared with sterile saline to facilitate the passage of guide wires (27).

The readiness of the fluoroscope should be checked together with the radiology staff.

Materials to be used during the procedure (cannula, guide wires, sphincterotome, balloon, stent, dilator, etc.) should be prepared beforehand (27). The connections of the cautery device should be checked, and the duodenoscope should be made operational (28).

5.3. The Nurse's Responsibilities During ERCP

Protective equipment (lead apron, gloves, protective goggles, mask) must be worn immediately before the procedure.

The patient should be informed and a rubber mouthpiece should be fitted to prevent them from biting their tongue during the procedure (28).

It is the nurse's responsibility to monitor the patient's vital signs, consciousness, comfort and clinical condition during the procedure. The nurse should record these data at intervals before, during, and after the procedure.

The heart rate, blood pressure, oxygen saturation and of the patient monitored prior to the procedure should be monitored at regular intervals. The nurse must be vigilant for complications that may arise from sedation. In the event of any complication, the doctor must be informed immediately. After the doctor has determined the patient's suitability for sedation, the medications to be administered and the level of sedation are determined. The nurse prepares and administers the medications under the direct instruction and supervision of the doctor. Before insertion into the endoscope, the cannula or device preferred by the physician should be filled with contrast medium. At the physician's request, the contrast medium should be injected while the injected amount is announced aloud. The injection should be performed slowly to prevent excessive filling of the pancreatic duct. The pressure level required to inject the contrast medium should be communicated to the physician. Excessive injection pressure should not be used. Excessive injection pressure can cause submucosal injection, particularly with cannulas that have a narrowed tip. The necessary precautions must be taken to maintain the sterility of the instruments used during ERCP (27,29).

5.4. The Nurse's Responsibilities After the Procedure

Once the procedure is complete, the elastic mouth guard fitted to prevent the patient from biting their tongue during the procedure should be removed. The patient should be kept under observation until the effects of sedation wear off and should be monitored and recorded at regular intervals (28).

The disinfection of the device and materials used after the procedure is the responsibility of the nurse (28).

Once the effects of sedation have worn off and vital signs are within normal range, the patient is transferred to the ward (28).

After the procedure, the patient should not be allowed to eat or drink for 2-4 hours. The patient should be given a clear liquid diet for the first 24 hours after oral intake is resumed (27).

Within the scope of monitoring and observation, vital signs, level of consciousness, body temperature and laboratory values should be monitored regularly (32).

Medicines should be administered in accordance with the doctor's prescription (27).

The patient should be closely monitored for complications following ERCP (acute pancreatitis, cholangitis and perforation). If any possible signs of pancreatitis occur, such as abdominal distension, tremors, hypothermia, hyperthermia, pain, nausea, vomiting or tachycardia, the doctor should be informed immediately (27). The patient should be

monitored with blood and urine tests during the first 24 hours (32).

The patient should be provided with early mobilisation, psychological support and patient education during the postoperative period.

If the patient has no further problems the next day, they will be discharged (28).

Due to the high procedural risk associated with ERCP today, the detection of adverse events following ERCP is of vital importance (33). A study conducted in a tertiary care hospital reported that telephone calls made by doctors and nurses on days 1 and 7 after ERCP were successful in detecting adverse events and referring patients to healthcare facilities (33). In a study evaluating the effect of pre-procedure video education and post-procedure continuous follow-up on the disease knowledge and psychological status of patients undergoing ERCP, patients were randomly divided into two groups. While patients in the control group received standard pre-procedure nursing education, patients in the education group underwent a structured education programme delivered by a multidisciplinary team consisting of physicians and nurses. Following admission to the ward, patients and their relatives were informed about the ward and procedure rooms, pre-procedure examination, and medication under the guidance of a nurse. Educational videos, prepared by combining videos and music jointly selected by team members and ERCP patients with ERCP videos, were used to educate patients one day before the procedure and answer their questions. After discharge, the nursing team provided regular home visits and individualised guidance, delivering targeted education on patients' clinical, daily living, and psychological conditions. The results of the study reported that the educational group had lower psychological status indicators (depression, anxiety and stress scores) and higher levels of self-care capacity, healthy lifestyle, disease knowledge and self-efficacy. These findings indicate that the intervention supported psychological well-being and increased patient and family satisfaction (24). A study evaluating the effect of video-based training provided prior to ERCP procedures in our country on anxiety and patient satisfaction reported that video-based training reduced state and trait anxiety and increased patient satisfaction after the procedure (34). The results of a study using a procedural nursing plan based on a mind map guidance model in ERCP to improve the haemodynamics and bowel function of patients undergoing ERCP suggest that this plan may reduce the effects of ERCP on patients' haemodynamics, support the improvement of bowel function, improve their psychological state, reduce post-procedure complications, and help increase patients' satisfaction with the nursing care process (20).

6. Conclusion

ERCP is a procedure with both diagnostic and therapeutic aspects, carrying a high risk of complications. Nursing care plays a critical role in psychological support, preventing complications, and enhancing treatment success. Therefore, it is important to increase nurses' knowledge, skills, and competence in this area, as well as to promote evidence-based practices.

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