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CASE REPORT

Management and Nursing Care of Monoparesis After Thoracoabdominal Aortic Aneurysm Surgery: A Case Report

Torakoabdominal Aort Anevrizması Cerrahisi Sonrası Monoparezi Yönetimi ve Hemşirelik Bakımı: Olgu Sunumu

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Abstract

Paresis/paraplegia is a serious complication that develops after open repair of thoracoabdominal aortic aneurysm (TAAA) and has high morbidity/mortality rates. To deal with paresis/paraplegia Cerebro Spinal Fluid drainage is recommended. Various approaches exist in this regard, such as the "clamp and fix" technique, the use of distal perfusion via partial (left heart) or total cardiopulmonary bypass. These approaches can reduce the complications of paresis/paraplegia by preventing spinal cord ischemic injury. In this study, we aimed to present a monoparesis management case diagnosed after TAAAA surgery.

Keywords: Cardiac surgery, monoparesis, paresis/paraplegia, spinal cord injury, thoracoabdominal aortic aneurysm repair

Öz

Torakoabdominal aort anevrizmasının (TAAA) açık onarımı sonrası gelişen parezi/parapleji ciddi bir komplikasyondur ve yüksek morbidite/mortalite oranlarına sahiptir. Buna bağlı olarak TAAA'sı açık onarımında spinal kord korunması önerilmektedir. Bu bağlamda çeşitli yaklaşımlar mevcuttur, "klemple ve onar" tekniği, kısmi (sol kalp) veya total kardiyopulmoner bypass aracılığı ile distal perfüzyonun kullanımı gibi. Bu yaklaşımlar, omuriliğin iskemik yaralanmasını önleyerek parezi/parapleji komplikasyonlarını azaltabilir. Bu çalışmada, torakoabdominal aort anevrizması cerrahisi sonrası teşhis edilen monoparezi yönetimi olgusunu sunmayı amaçladık.

Anahtar Kelimeler: Kalp cerrahisi, monoparezi, parezi/parapleji, omurilik yaralanması, torakoabdomoninal anevrizma onarımı

Introduction

Thoraco abdominal aortic aneurysm (TAAA) is a progressive disease and its incidence increases with age. Aortic aneurysm by needing rapid diagnosis and surgical repair maintains importance in terms of high mortality and morbidity. Paraplegia/paresis related to spinal cord injury (SCI) has been one of the most feared and devastating complications of TAAA surgeries since they were first performed (1). Nowadays, as just recently published by Coselli et al. (1) the pooled rate of spinal cord (SC) ischemia -although noticeably lower compared to older reports-

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remains high with 13.6%, even in experienced centers. Known risk factors for SCI after repair of the TAAA include a wide range of factors related to aneurysm types, surgical techniques, or patient characteristics. How to best protect the SC is one of the dominant concerns today. Continued and improved collaboration across the spectrum of patients is required to solve these problems (1). The operative strategies developed by surgeons to reduce the risk for SCI like moderate hypothermia, hemodynamic parameters, left heart bypass for distal aortic perfusion to maintain the SC's collateral vascular network motor and somatosensory evoked potential monitoring and cerebrospinal fluid (CSF) drainage have been shown to be effective and safe in major series to reduce postoperative SCI (2-4). These techniques are also recommended in the American Heart Association/American College of Cardiology Foundation Guidelines (2010) also recommends CSF drainage TAAA open and endovascular repair (5).

SCI is considered to be the result of a temporary or permanent interruption of SC blood supply. It has been demonstrated that the maintenance of distal aortic flow protects against SC ischemia.

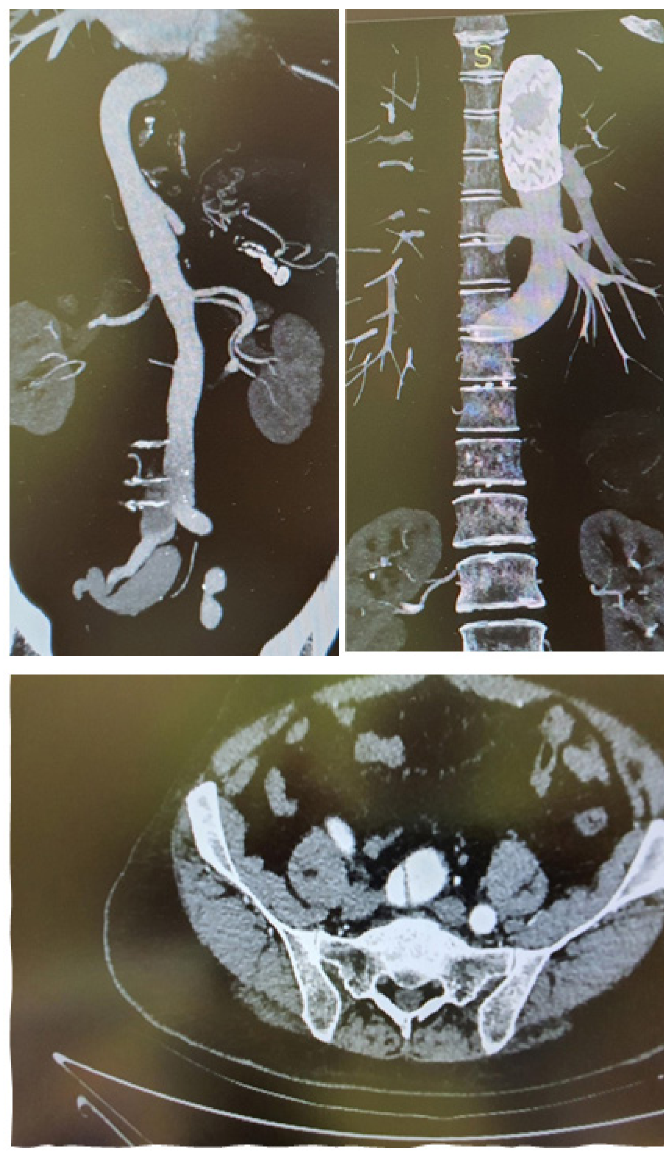
The aim of this article is to evaluate the treatment strategies of monoparesis after surgical intervention for TAAA despite to the recent developments and to share our experience.

Case Presentation

Fifty-six years old male patient underwent zone 3 thoracic endovascular aortic replacement procedure for type B dissection 5 years ago. In the follow-up, the patient developed type III TAAA and became symptomatic so thoraco-abdominal aortic surgery was performed. The patient had no other feature or concomitant disease other than hypertension. The cases whose coagulation parameters were within normal limits was categorized as ASA V (American Society of Anaesthesiology III) risk class. In addition to type III TAAA, it was observed that the aneurysm extended to the right internal iliac artery orifice (Picture 1).

After written consent and completing the necessary preparations, due to the difficulty of accessing the right internal iliac region with a thoracoabdominal incision, 3 days before the operation, the proximal femoral artery was ligated by performing a cross-femoral (femoro-femoral) bypass with an 8 no PTFE graft under general anesthesia. The newly performed femoro-femoral bypass was followed up for pulse control for 3 days and it was active, after 3 days open surgical repair was performed.

As it increases surgical field visibility, reduces the risk of lung injury and allows the lungs to deflate the patient was intubated with a double lumen (Carlens) endotracheal tube under anesthesia but was not curarized. Afterwards, a CSF catheter was placed through the midline approach to the L3-4 intervertebral space. By using the Seldinger and the loss of resistance method, the intrathecal distance was reached with a 14G needle and the silicone probe was sent through the guide. After detecting CSF flow, the guide was withdrawn and the cathether left 4 cm inside the CS area and fixed to the skin with adhesive tape. After skin detection CSF flow was checked again. Regular and necessary drainage was provided by CSF pressure monitoring. During



Picture 1.
Computed tomography showing the preoperative situation of the aneurysm

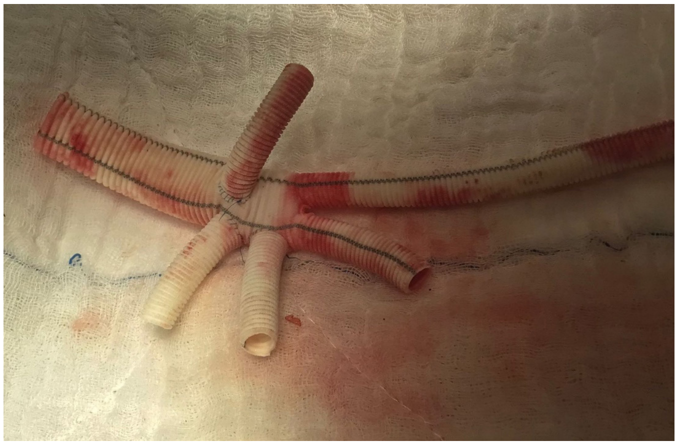
Main Points

- Spinal cord injury (SCI) remains one of the most feared and devastating complications in thoraco abdominal aortic aneurysm surgery even after more than seventy years of continuous development.
- Current operative strategies developed by surgeons to reduce the risk for SCI are effective and recommended during and after surgery.
- Management and close monitoring of SCI symptoms is effective in reversing the negative outcomes.

the operation, the patient was monitored with Motor evoked potential-movement (MEP) by the neurologist and her team. Intraoperative somatosensory-evoked potentials (SSEPs) and motor-evoked potentials (MEPs) have been commonly used since the early 2000s to monitor SC function. Both methods are helpful in guiding the conduct of operation, especially the timing of the intercostal artery reconstruction. Many aortic surgery centers use only MEPs (6-10).

The patient laying on the left lateral position, an incision was made starting from the 6th intercostal space up to the umbilicus. The aneurysm tissue was seen by opening the diaphragm circumferentially. After heparinization, midthoracic aorta and left femoral artery were cannulated and connected to cardiopulmonary bypass (CPB) (heart lung machine) device for distal circulation. 20/10 dacron bifurcation graft was prepared accordingly with the patient anatomy by adding 3 more branches (Picture 2).

By placing sequential cross clamps on the aorta, an aortotomy was performed and the bleeding intercostal arteries were ligated. Proximal aorta anastomosis was performed in the first place. In order to increase the proximal blood pressure, the patient, who had MEP signal loss especially in the right leg, was intervened medically and the distal circulation was continuously provided so MEP signal normalization was achieved. After visceral and left iliac anastomosis right iliac artery orifice was closed. The patient, who was stable and had no problems, was separated from the CPB device and after bleeding control, thoracic and abdominal drains were placed and the layers were closed in accordance with the anatomical method. The patient was transferred to the cardiovascular surgery intensive care unit without the endotracheal tube being replaced. The patient started to wake up after approximately 3 hours and was extubated after 10 hours. No problems were observed during the neurological examination. It was noticed that the CSF catheter was not working properly and it was withdrawn. A total of 45 mL of CSF was drained intraoperatively and 25 mL postoperatively. Monoparasia/



Picture 2.
A dacron graft was prepared accordingly with the patient's anatomy

monoplegia, especially in the right leg, was observed in the patient who had mild hypotension at the 16th hour and was not treated in the first place. The team =anesthetist tried to place a CSF catheter, hypertension was created medically (norepinephrine infusion) to avoid medulla spinalis ischemia, and it was observed that the monoparesis picture improved dynamically. The CSF catheter was reinserted under sterile conditions and active drainage was started. In the following hours, it was observed that the table was completely corrected. A total of 180 mL of CSF was drained from the patient.

Hemodynamic stability, mild hypothermia (31°-33 °C), CSF drainage, distal perfusion and MEP monitoring are performed in order to prevent paraplegia in the operation. Despite all the precautions in our case, temporary paraplegia was observed in the postoperative period and it was possible to recover with interventions.

Nursing Care

The high frequency of neurological complications, even in late series, due to SC ischemia in aortic surgery has increased the interest toward the subject these recent years. Paraplegia or paresis is seen as a result of ischemia due to intraoperative and postoperative or even preoperative SC edema and reperfusion disorder. Neurological problems in patients can be seen right after the effect of anesthesia passes or late after surgery, usually 1-5 days later. It needs to be emphasized that nurses should evaluate the presence of preoperative paraplegia and paresthesia due to compression in thoracoabdominal aneurysms by a proper neurological examination. Likewise, in the postoperative period, the neurological examination begins with the patient's arrival in the intensive care unit, continues at regular intervals and is recorded in special forms that might change from an institution to another. Neurological examination is performed regularly for at least 24 hours depending on patients' clinical conditions and multidisciplinary team decisions. Nurses should focus and know in details SCI prevention methods and their care. SC is fed through the intercostal and lumbar arteries supplied by descending and abdominal aorta. SC perfusion pressure is equal to the difference between the arterial pressure provided by these branches and the CSF pressure. Therefore, the continuation of SC perfusion theoretically depends on avoiding hypotension and increased CSF pressure. Prevention of SCI by CSF drainage during temporary thoracic aorta clamping was first suggested by Miyamoto et al. (11). Related to this prevention, a spinal catheter is inserted pre or perioperatively. Normal CSF pressure values varies between 5-10 mmHg. When CSF pressure is over 10 mmHg, drainage is performed through the special closed drainage system to lower the pressure (7). While using this special drainage system, nurses need to pay maximum attention to hygiene and sterility and use it correctly.

Hypothermia is another important preventive measure as it reduces metabolic requirements up to 50%. To cause hypothermia before cross-clamping, two methods can be applied; whole body cooling with cold perfusion or regional cooling (8). Hypothermia is usually applied and followed by anesthesia and perfusion team. Nurses monitor temperature and other vital signs. In the postoperative period it's vital to apply appropriate heating method as soon as the patient is transferred to the cardiovascular intensive care unit. In order to prevent the undesirable hyperthermia, the warming process is stopped when patient's temperature reaches 36.0 °C. This practice may show clinical differences. Nurses should be aware of the risks of both situations, hypothermia and hyperthermia.

Motor evoked potential (MEP) monitoring: In many centers dealing with spinal correction surgery, intraoperative neurologic monitoring is used as a standard to detect neurological changes (9). MEP is the recording of motor potentials from the distal SC or related muscle groups. It gives quick feedback to the surgeon and provides great convenience to respond quickly to the warning. This is the reason why it's used largely in TAAA. Although since it's mostly applied only during surgery, the responsibilities of nurses in this regard are limited. They may collaborate, organize and assist the neurological team when needed.

As in our case, despite all precautions if paraplegia or paresis occur nurses should provide the necessary support and care for the patient and his/her family until the problem is resolved.

Otherwise, if paraplegia/paresis is permanent, nurses should provide support for the patient/family in different topics such as rehabilitation, immobile patient care, caregivers roles etc.

Discussion

As a result of very intensive studies, great advances have been made in the surgical treatment of the TAAA nowadays. The risk of paraparesis/paraplegia, which is reported to be 5-10% on average in the surgical treatment of thoracoabdominal aortic lesions, and the use of methods such as monitoring of evoked potentials in the brain and SC and CSF drainage has reduced the frequency of SCI due to surgery. However, in recent years, there are studies showing that the rate of paraplegia after TAAA surgery is still around 10% (10).

TAAA affects multiple organ systems detailed attention from a multidisciplinary team (surgical, critical care, nursing, pharmacy, nutrition and physical therapy) is required to ensure optimal perioperative management (1).

Achieving successful outcomes requires attention to detail across the perioperative, intraoperative and postoperative phases of treatment (3).

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