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Original Article

Management of obturator nevre injury during pelvic lymph node dissection

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ABSTRACT

Objective: Obturator nerve injuries may be seen during pelvic lymph node dissection in oncological surgery and although not common it is an important complication. According to the shape and location of the injury, tingling and loss of sensation may develop on the inner surface of the leg, together with loss of motor function of the adductor muscles. In this study an evaluation was made of these complications encountered in our clinic and the management strategies applied to these patients.

Material and methods: The data were retrospectively reviewed of 843 patients who underwent open radical retropubic prostatectomy between January 2002 and May 2016. To confirm obturator nerve palsy, electrophysiological investigation (ENG-EMG) was performed immediately postoperatively and 3 weeks later.

Results: A total of 6 obturator nerve injuries occurred during pelvic lymphadenectomy (0.7%). Reapproximation end to end with sutures was applied in 3 case and sural nerve graft in 1. In the other 2 patients, just clips were placed and these were removed early during the operation. After the treatment period, neurotropic medications or physiotherapy were given in some cases according to the neurological examinations.

Conclusion: Obturator nerve injury can be prevented by having a comprehensive knowledge of pelvic anatomy, and avoiding the use of electrocautery during lymph node dissection. The repair should be performed as soon as possible, with a tension-free reapproximation of the ends, using electrophysiological tests with a multidisciplinary approach and benefit should be taken from physiotherapy and medical treatment when needed.

Keywords: Obturator nerve injury; oncological surgery; pelvic lymph node dissection.

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Introduction

The obturator nerve is derived from the lumbar plexus between L2-L4 segments. It is responsible from motor innervation of the adductor muscles of the lower limb and sensory perception on the medial side of the leg. It descends through the fibers of the psoas major muscle, and emerges from its medial border near the brim of the pelvis. It then passes behind the common iliac arteries, courses on the lateral side of the internal iliac artery and ureter, and runs along the lateral wall of the lesser pelvis, above and in front of the obturator vessels, up to the upper part of the obturator foramen.[1]

Obturator nerve injury (ONI) is a rare but important complication. It may be observed during pelvic lymphadenectomy (PLND), but it may also develop during other surgeries such as hernia repair, endometriosis, hip surgery, forceps-assisted births, transobturator tape (TOT) and transvaginal tape (TVT) surgeries.[2] Neuropraxia, electrofulguration injury, complete and incomplete dissections, tension-dependent deterioration and corruption of the nerve integrity with the clips may be observed.[3] Motor and sensory loss may occur in the lower limbs depending on the kind of injury.[4]

There are reviews of case reports in literature about ONI related to PLND performed

with laparoscopic and robotic oncological approaches.[3,5,6] In current literature, the prevalence rate of ONI during radical prostatectomy has been reported up to 1.1 percent.[7] The aim of this study was to evaluate the prevalance and treatment of the approach to ONI during open radical prostatectomy at our clinic.

Material and methods

This study was performed on 843 patients with locally-advanced prostate carcinoma who underwent open radical prostatectomy in our clinic between January 2002 and May 2016. A retrospective analysis was made concerning the demographic characteristics of the patients, age, comorbidities, clinical and pathological stage and grade, operation time, American Association of Anesthesiology (ASA) score and postoperative complications. Complications were classified according to the modified Clavien classification system.[8] Patients with neurological deficits related to the lower extremities, those undergoing preoperative chemotherapy or radiotherapy, cases with incomplete data or without any history PLND were excluded from the study.

All study participants underwent radical prostatectomy and PLND. Obturator nerve injury was observed in 6 cases (0.7%). Neurological evaluation was performed for all patients who developed ONI. Electrophysiological research (ENG-EMG) was performed in the immediate aftermath of ONI and at 3 weeks postoperatively. Motor and sensory functions of both lower limbs were evaluated and related sequelae were compared.

Statistical analysis

Statistical analysis was not performed because of the low number of patients. Due to its retrospective nature, ethics committee approval was not required. Written informed consent was obtained from all patients. The study was designed in accordance with the 2013 Helsinki declaration.

Results

Obturator nerve injury was observed during PLND in 6 patients. Nerve repair was made intraoperatively in all cases. Demographic data of the patients and the nerve damage patterns are shown in Table 1. The mean age of the patients was 62±6.43 (49-78 years). Obturator nerve injury occurred due to inadvertent clip placement, electrofulguration and complete or incomplete transection. All the nerve injuries were located in the obturator fossa.

In 3 patients with inadvertent clip placement on the obturator nerve, the clip was removed intraoperatively. In 2 cases the limitation of adduction continued for a lengthy period, with healing seen in the 3rd month in 1 case and the 6th month in the other one. In one case loss of medial surface sensation in the leg after surgery improved within 1 week with no requirement for additional treatment. The examination of the right lower extremity was completely normal and the neural examination was unremarkable.

In one case ONI was caused by an incomplete transection because of thermal injury to the obturator nerve during PLND. This was immediately, and successfully repaired using 6/0 polyprolene (Prolene; Ethicon, Somerville, NJ) sutures. Tingling on the anterior and medial of the leg was reported. Sensorial and motor functions were within their normal ranges in the ENG-EMG tests applied on the postoperative 4th day.

In the 5th case there was complete transection of the obturator nerve. Microsurgical repair namely end-to-end tension- free anastomosis was performed by a plastic and reconstructive surgeon experienced in peripheral nerve surgery using 6/0 polypropylene sutures. In this case, the period of weakness in the adductor muscle function, and loss of sensation in the inner part of the leg continued for 3 weeks after surgery. Total axonal degeneration of this nerve was detected in the early electrophysiological test and neurotropic drugs were started. The patient reported that leg movements felt abnormal during walking. After 1 month of medical treatment of neurotropic factors (vitamin B6), neurological examinations showed a protective reflex of the adductor muscle and some loss of sensation was observed. Electromyography of the adductor muscle demonstrated sequelae of axonal injury.

The 6th case had experienced complete nerve transection plus thermal injury so there was a considerable physical, and functional differences between both extremities. Anastomosis was applied by a plastic and reconstructive surgeon using sural nerve graft from the right leg because epineural end- to- end tension-free anastomosis was not possible. In this case physiotherapy and medical treatment with neurotropics were continued for 6 months due to limitation of adduction and tingling sensation in the early postoperative period. After 6 months weakness of the adductor muscle had decreased but tingling sensation persisted. At the same time, muscle atrophy was observed in the lower extremity. Finally, the patient's neurological deficits were evaluated as permanent, with severe nerve damage seen electrophysiologically known as "neurotmesis". This patient died of natural causes one year after the operation. When all cases were evaluated, we didn't find any risk factors like PSA, Gleason score and lymph node involvement to predict nerve injury. There was no difference in comorbidities, clinical and pathological stage and grade, operation time and postoperative complications among cases of ONI.

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Table 1. Demographic, and clinical data of the patients with obturator nerve injury

Data	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Age (year)	73	55	61	62	66	71
Gender	Male	Male	Male	Male	Male	Male
ASA scores	2	2	3	2	2	3
Clavien scores	2	2	2	3b	3b	3b
Type of ONI	Clipping	Clipping	Clipping	Thermal injury + incomplete cut	Complete transection	Complete transection + thermal injury
Management	Removal of the clip	Removal of the clip	Removal of the clip	Simultaneous	End-to-end anastomosis	Sural nerve grafting
Complaint	Loss of sensation on interior aspect of the leg	Weakness in adduction and loss of sensation in the medial part of the leg	Weakness in adduction and loss of sensation in the medial part of theleg	Tingling	Weakness in adduction and loss of sensation in the medial part of theleg	Weakness in adduction and tingling
Discharge (Postoperative days)	7	5	5	5	6	9
EMG results	Normal	Normal	Normal	Neuropraxis	Total axonal degeneration	Neurotmesis
Postoperative therapies	-	Neurotropic drugs	Neurotropic drugs	-	Neurotropic drugs	Physiotherapy+ Neurotropic drugs

ASA: American Association of Anesthesiology; ONI: obturator nerve injury; EMG: electromyography

Discussion

Prostate cancer is the second common cancer among men and the surgical treatment options have been the primary treatment for localized prostate cancer.[9] In intermediate-and high-risk patients PLND is suggested for its benefits in terms of staging the disease, and predicting biochemical recurrence and oncological outcomes.[10,11] Although the benefits of the surgery are well known, complications may still be annoying. Obturator nerve injury is a rare complication and it usually occurs from iatrogenic causes such as stretching the nerve, use of electrocautery near the nerve, cutting or placing a clip on the obturator nerve during PLND.

Various complaints have been reported depending on the type and extent of the injury. Although often diagnosed and repaired during the operation, tingling, loss of adduction function and sensation on the medial side of the leg may develop. In the literature, ONI has frequently been reported during laparoscopic and robotic surgery and these articles have been always case reports.[3,5,6] ONI has been reported at a frequency of 0.2%-5.7% during PLND.

These complications can be avoided with a knowledge of pelvic anatomy and adherence to surgical principles. The identification of the external iliac vein and obturator canal in particular decreases the probability of ONI. Dissection should be performed carefully. During PLND clips should be used instead of electrocautery to prevent thermal injury to the nerve. In respect of full recovery, early intervention is very important in cases of ONI. A few studies in the literature claimed high rates of success using end-to- end anastomosis after injury, although sural nerve grafts may be necessary to reduce neurological deficits when tension-free anastomosis is not possible because of a considerable gap between the nerves.[12,13] Hallgren et al.[14] concluded that the sural nerve was good greft material based on a study of 41 cases with significantly reduced complaints 1 year after ONI where sural nerve graft was used for repair. Repairs should be made within 1-3 days of the injury because of the expansion of anastomosis due to fibrosis. The healing process may take up to a year as nerve regeneration is extremely slow. In the current study, all cases were treated in the early stage and neurological improvement was observed at 3th months postoperatively.

Physiotherapy and medical treatment have been used to provide acceleration of the healing process following surgical repair.

Studies about the effect of physiotherapy have shown that it can be used as a first-line treatment, although it will only help regain motor and sensory functions. However, there is no concensus about the duration of physiotherapy.[15] Stolzenburg et al.[16] administered vitamin B6 as medical treatment to patients and reported that it helped innervation. Use of ENG-EMG has been recommended to determine the extent of nerve injury and to evaluate the benefits of treatment during follow-up period. Although computed tomography (CT) and magnetic resonance imaging (MRI) techniques are not highly specific, they can be applied for diagnostic purposes.[17] In the current cases, the level of the nerve injury was identified with EMG after primary repair and at subsequent follow-up examinations EMG was again applied. The patients received medical treatment and physiotherapy when necessary. However, the duration of physiotherapy and medical treatment were not standardized as has been noted in literature. The most important factor in the management of these cases appears to be a multidisciplinary approach with collaboration of neurologists and physiotherapists.

In conclusion, ONI is a rare but important complication which may be seen during radical pelvic surgeries. Surgical experience, and meticulous attention to anatomic details are essential to prevent this injury. Immediate repair of the nerve is essential if complete transection occurs and additional medical treatments and physiotherapy will support the healing procedure.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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