CASE REPORT

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Plexopathy Due to Bilateral Lumbosacral Plexus Involvement in a Patient with Prostate Cancer: A Case Report and Review of the Literature

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ABSTRACT The perineural spread could be seen in prostate cancer. In this study, we present a case of prostate cancer with bilateral lumbosacral plexopathy. A 73-year-old male patient was diagnosed with prostate adenocarcinoma on routine screening in 2005. Orchiectomy was performed, and he was followed up without any additional treatment. The patient was asymptomatic until 2014 and admitted to the hospital in 2014 due to pain, anuria, sensory and motor deficit in the lower extremities. The magnetic resonance imaging revealed bilateral lumbosacral plexopathy. Between November 16, 2015, and May 2, 2015, the patient was administered 2 Gy daily total of 50 Gy image-guided radiotherapy with tomotherapy for sacral plexus localization. Pain palliation was provided. However, the incontinence continued. The patient died 2 years later.

Keywords: Prostate cancer; lumbosacral plexopathy; perineural invasion; case report

The estimated number of new cases in 2020 is 1,114,259 in the world, and it continues 15.1% of all cancer in men, according to Global Cancer Observatory data.[1] The 5-year surveillance for localized disease is approximately 100%, whereas, in metastatic disease, this rate is reduced to 28%.[2] The perineural spread could be observed in prostate cancer. Inferior hypogastric plexus involvement around the prostate is usually the first invasive region. Subsequently, the involvement of the lumbosacral plexus through the pelvic and sacral splenic nerves may be seen. After reaching the lumbosacral plexus, the tumor could spread to other spinal nerves or even to the intradural space. As in this case report, perineural involvement can also be seen in pelvic cancers.[3] In this study, a case of prostate cancer patient who developed bilateral lumbosacral plexopathy and hematuria was treated by palliative radiotherapy.

Review of Literature

We searched the PubMed database (National Library of Medicine, http://www.ncbi.nlm.nih.gov) between January 1984 to January 2022, using the following search terms prostate cancer, plexopathy, case report. As a result of this search, 7 articles were identified, and 10 patients were presented in these articles (Table 1).

CASE REPORT

A 73-year-old male patient was diagnosed with prostate adenocarcinoma on routine screening in 2005 for prostate-specific antigen (PSA) elevation reasons.

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TABLE 1: Review of the literature.

Reference no	Case	Age	First treatment	Duration of the LSP	Symptom of the LSP	Diagnostic examination for LSP	Localization	Treatment after LSP
3	Case 1 (The first stage: T3aN0M0)	64	NAHT+surgery	6 years	Motor and sensory deficit urinary, fecal incontinence	MRI, choline PET/CT, biopsy	L5-S1	Surgery+HT
6	Case 2, Case 3, Case 4, Case 5	53-78 (median 67)	Surgery (n=3)	1-7 years	Motor and sensory deficit	Choline PET/CT, FDG PET/CT, MRI, biopsy	Lumbosacral plexus (not detailed)	NS
10	Case 6 (The first stage: Stage 4)	60	NS	At the time the diagnose	Bladder incontinence, erectile dysfunction, constipation, perianale numbness, pain	MRI, biopsy	L5-S4	NS
11	Case 7	70	EBRT	4 years	Numbness, weakness	MRI, biopsy	L3-S5	NS
12	Case 8	61	Surgery	5 years	Cauda equina syndrome	MRI	L1-5 (and also seven thoracal vertebras	RT
13	Case 9	74	EBRT	12 years	Weakness, sensory deficit	MRI, biopsy	L5-S2	Surgery
14	Case 10 (The first stage: T2aN0M0)	78	EBRT	6 years	Rectal incontinence, weakness, sensory deficit	FDG PET/CT, MRI	L4-S1	HT
	Case 11 (The current case)	73	Orchiectomy+EBRT	9 years	Motor and sensory deficit	MRI	L5-S1	RT

LSP: Lumbosacral plexopathy; NAHT: Neoadjuvant hormonal therapy; MRI: Magnetic resonance imaging; PET/CT: Positron emission tomography/computed tomography; HT: Hormonal therapy; FDG: Fluorodeoxyglucose; NS: Not specified; EBRT: External body radiotherapy; RT: Radiotherapy.

There was not enough data about the stage at the time of diagnosis. Orchiectomy was performed, and he was followed up without any additional treatment. The patient was asymptomatic until 2014 and admitted to the hospital in 2014 due to hematuria. The PSA was 12.27 ng/mL, alkaline phosphatase was 369 U/L, urea: 80 mg/dL creatinine 1.22 mg/dL. Transurethral resection-prostate and bladder (TUR-PB) was performed on May 9, 2014. The TUR-PB showed a papillary 2 cm mass in the bladder left ureteral orifice and prostate invasion of the bladder neck. Multiple biopsy samples were taken from suspected areas. Simultaneously, a 3-way catheter was inserted, and the procedure was terminated. The biopsy was reported as high-grade prostate adenocarcinoma. The patient was admitted to the hospital 3 months later with severe hip pain, bilateral loss of strength in the lower extremity, and urinary incontinence. The patient was evaluated as Eastern Cooperative Oncology Group 3. There was a loss of strength in the right distal lower extremity (1/5), a loss of strength in the left distal lower extremity (2/5), and bilateral proximal lower extremity (2/5). Bilateral distal lower extremity sensory loss was observed in the L5-S1 region-the patient described urinary incontinence and had no fecal incontinence. Electromyography could not be done because the patient did not comply. The patient's total PSA value was 25 ng/mL at this admission.

Metastasis of the L1 vertebra was observed in bone scintigraphy. In the lower abdomen magnetic resonance imaging (MRI), a mass invading the Denonvilliers fascia from the posterior central and left posterolateral to the prostate gland and invading the prostate capsule and perirectal fat tissue was observed. The prostatic capsule and bilateral seminal vesicles appeared invasive on MRI. Bilateral parailiac metastatic lymphadenopathies of 3 cm in

the right parailiac and 1 cm in the left parailiac are observed. In the MRI of the sacral plexus, thickening was observed in both sacral plexus nerves, prominently on the right. Hyperintensity was observed on T2 examination due to bilateral sacral plexus edema (Figure 1). The radiologist explained that these findings might be related to plexopathy. The patient did not accept biopsy and any invasive approach. Patient images were evaluated in detail by radiology, and it was decided that there was bilateral sacral plexus involvement. Between November 16, 2015 and May 2, 2015; the patient was administered 2 Gy daily total 50 Gy image-guided radiotherapy with tomotherapy for sacral plexus localization, and 20 Gy, palliative RT, was applied to the entire bladder for massive hematuria. Palliation was achieved in pain and hematuria, but there was no improvement in urinary incontinence. The patient died on June 15, 2016. The next of kin/guardians have consented to the submission of these case reports to the journal.

DISCUSSION

According to data from the United States of America, 450 thousand new pelvic malignancies (anorectal, genital, bladder, and ureteral) are diagnosed each year. Lumbosacral plexopathy is diagnosed in only 0.71% of all pelvic cancers. This ratio is predicted to be higher than noticed.[4] Perineural invasion (PNI) is an unfavorable prognostic factor for prostate cancer.[5] PNI is considered the first stage of perineural progression and is defined as tumor cell tracing in any of the three layers of the nerve sheath, and the spread could be both anterograde and retrograde. With this spread, local symptomatic neurological findings and distant metastases can be seen.[6]

PNI has been well described in head and neck tumors, especially in adenoid cystic pathologies. Besides, this spread could be seen in gallbladder, pancreatic, and colorectal cancers.[1,6] PNI is reported in 7-43% of prostate cancer biopsies and 77-93% of prostatectomy materials.[3] Although lumbosacral plexopathy due to prostate cancer is observed more common, brachial plexopathy and leptomeningeal extension have been reported in the literature.[7,8]

Visceral innervation of the pelvis occurs mainly with the superior and inferior hypogastric nerve. The superior hypogastric plexus is located in the aorta bifurcation and includes sympathetic lumbar splenic nerves. The inferior hypogastric nerve consists of both sympathetic and parasympathetic nerves from S2-4 and is associated with rectal plexus, vesicoureteric plexus, female uterovaginal plexus, and male prostate plexus.[1,4] Lumbosacral plexus involvement usually occurs after the diagnosis of malignancy. There is only 1 case in the literature that developed lumbosacral plexus before the diagnosis of pelvic malignancy.[4]

In the case of sciatic nerve involvement, sensitivity is observed by percussion on sciatic nerve tracing. If there is pelvic sympathetic nerve involvement, findings related to sweating and decreased vasomotor activity called dry and warm legs may be observed.[9] It is thought that the spread of PNI is slow to develop and presents symptoms between 1-7 years.[4]

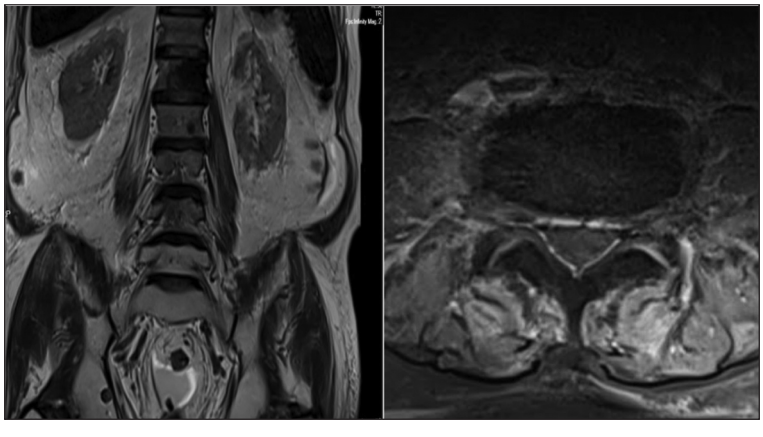

FIGURE 1: Magnetic resonance imaging images of the patient with plexus involvement before radiotherapy.

Electrodiagnostic methods can provide information about the presence, localization, and even the origin of the involvement. For example, if there are myochemical changes, this can be interpreted in favor of the damage of the previously applied radiotherapy.[10]

In imaging studies related to the subject, it was stated that the lesion could be identified in 3T MRI series in post-gadolinium series. Additionally, T1 choline-based sequences conforming to the standard peripheral nerve protocol and cho-based sequences (spoiled gradient recalled echo) and T2-based sequences (including fast spin-echo) were also recommended. However, differential diagnosis with MRI may be difficult in patients with previous radiotherapy. Expansion of nerves may be seen in lumbosacral plexopathy after radiotherapy. These images become prominent in the post-gadolinium T2 series, and post-radiotherapy fibrosis could be observed. However, radiotherapy fibrosis is more homogeneous and linear.[4]

Lumbosacral plexopathy is not frequently reported in prostate cancer patients. However, it should be considered in the differential diagnosis, especially in patients with sensory and motor deficits in lower extremities and incontinence.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Gonca Altınışık, Süheyla Aytaç Arslan;* ***Design:*** *Gonca Altınışık İnan, İpek Pınar Aral, Süheyla Aytaç Arslan;* ***Control/Supervision:*** *Süheyla Aytaç Arslan, Karabekir Ercan;* ***Data Collection and/or Processing:*** *Feyza Yaşar Daşgın, Gonca Altınışık İnan, Karabekir Ercan;* ***Analysis and/or Interpretation:*** *Gonca Altınışık İnan, İpek Pınar Aral, Süheyla Aytaç Arslan, Karabekir Ercan;* ***Literature Review:*** *İpek Pınar Aral, Gonca Altınışık İnan;* ***Writing the Article:*** *Gonca Altınışık İnan, İpek Pınar Aral;* ***Critical Review:*** *Gonca Altınışık İnan, İpek Pınar Aral, Süheyla Aytaç Arslan;* ***References and Fundings:*** *Gonca Altınışık İnan.*

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