
The Management Of Incidental Serious Pathology During Elective Anterior Lumbar Spine Surgery: A Case Of Retroperitoneal Paraganglioma And Review Of The Literature

D Noyes, M Shaw, N Birch

Citation

D Noyes, M Shaw, N Birch. *The Management Of Incidental Serious Pathology During Elective Anterior Lumbar Spine Surgery: A Case Of Retroperitoneal Paraganglioma And Review Of The Literature*. The Internet Journal of Spine Surgery. 2004 Volume 1 Number 2.

Abstract

Pheochromocytoma is a rare tumour arising from cells of neural crest origin. The majority occur in the adrenal medulla. 10% occur elsewhere in the sympathetic nervous system when they are referred to as paragangliomas. 90% of paragangliomas arise in the glomus jugulare or carotid bodies. 10% are found elsewhere, from the skullbase to the pelvis.

This case report discusses the investigation and management of metastatic paraganglioma discovered during anterior spinal surgery. With increasing numbers of spinal surgeons using anterior approaches to the lumbar spine to implant disc replacements, the need to be prepared to manage unexpected and unfamiliar pathologies, within the retroperitoneum, is clear.

There is one report of a retroperitoneal paraganglioma presenting with cauda equina compression secondary to local invasion, in the literature. We believe that this is the first report of this tumour being discovered during elective anterior spinal surgery.

Stryker UK provided funds to support the post of Clinical Fellow

CASE HISTORY

A 56 year old woman presented with a long history of right sided thoraco-lumbar, groin, bilateral posterior thigh and calf pain with left sided numbness in the L5 distribution. She had been previously investigated by both a gynaecologist and urologist because of the unusual distribution of her pain but no abnormalities were found on pelvic ultrasound or flexible cystoscopy.

Her past medical history included a caesarean section, a laparoscopic cholecystectomy and recurrent urinary tract infections.

Examination of the spine revealed no obvious deformity. She was tender in the upper lumbar spine both in the midline and para-vertebrally. Extension and rotation were full, with forward flexion slightly restricted at 5cm on Schobers test (normal 6 – 9 cm). Objectively she had no sensory or motor

loss in either lower limb but had bilateral brisk reflexes and up-going plantar reflexes with one beat of clonus. Straight leg raise was 60± with a positive femoral stretch test and negative sciatic stretch test bilaterally.

Plain X-rays demonstrated a grade 1 degenerative spondylolisthesis at L4/5 and a grade 1 lytic spondylolisthesis at L5/S1. Magnetic resonance imaging (MRI) showed degeneration of the L4/5 and L5/S1 discs with foraminal and lateral recess stenosis at L4/5, but only foraminal stenosis at L5/S1. After a full course of conservative treatment over a period of nine months there was no clinical improvement and after full counselling she elected to undergo a circumferential decompression and fusion with correction of spondylolisthesis using pedicle screw instrumentation and interbody fusion cages from L4 to S1.

At operation it was impossible to insert a screw safely into the left L4 pedicle (neurological monitoring of the L4 and

L5 roots demonstrated a pedicle breach that could not be safely revised) so the instrumentation was extended to L3, but the fusion limited to L4/5 and L5/S1. The plan would be to remove the metalwork electively a year after surgery when the fusion mass was solid. During the retroperitoneal exposure of the lower lumbar spine the soft tissues in the gutter between the spinal column and psoas muscle at L4/5 were found to be matted down and contained several enlarged rubbery lymph nodes. There was obvious inflammation of the belly of the psoas muscle itself extending over a 3cm distance. Two of the lymph nodes were biopsied. Palpation of the remainder of the para-aortic chain revealed some softer nodes more proximally distal to the origin of the renal arteries. Tricortical iliac crest graft was harvested and used for the interbody fusion instead of cages because of concerns that the enlarged nodes might represent a possible infective process given her previous urological history.

Her post-operative recovery was uncomplicated and she was discharged to home eight days after surgery in a custom-built thoraco-lumbar spinal orthosis (TLSO). The TLSO was worn for three months after surgery during the first part of her rehabilitation programme. She weaned out of the brace between twelve and sixteen weeks after operation at which time she returned to work. One year after surgery she had made a complete clinical recovery with full resolution of her pre-operative symptoms and x-rays showed a solid fusion at both levels. Her Low Back Outcome Score (maximum 75) rose from 43 pre-operatively to 71 at the twelve month follow-up.

Histological analysis of the biopsy specimens showed paraganglioma in both nodes. Symptomatically and clinically there was no suggestion that this was a secretory tumour. She went on to be investigated radiologically and biochemically.

Computed axial tomography (CT) scan showed para-aortic lymphadenopathy extending from the adrenal glands to the lower border of the kidneys. The largest node measured 15mm. The lungs, liver spleen and kidneys were normal and there was no thoracic lymphadenopathy. 123I-Metaiodobenzyl-guanidine (MIBG) scan showed no focus of increased uptake anywhere in the paraspinal tissues from skull-base to pelvis. Twenty-four hour urinary vanillmandelic acid (VMA) and catecholamine assays were within the normal range. Initial urinary 5-hydroxyindoleacetic acid (5-HIAA) was elevated but this

was thought to be due to the patients' daily consumption of one banana (5-HIAA levels can be elevated by the consumption of bananas, avocado pears, kiwi fruit, tomatoes, walnuts, pineapples and cough medications). Subsequent testing when she had eaten no fruit for three days showed normal urinary levels of 5-HIAA.

The patient was referred to an urological surgeon with wide experience of managing retroperitoneal malignancy for radical retroperitoneal lymphadenectomy.

Histopathological analysis of the tissue removed confirmed the diagnosis of multifocal extra-adrenal paragangliomas. Local infiltration was seen in the resection specimens and the surgical margins were positive indicating the malignant nature of the condition. However, the mitotic activity within the lesions was low implying a slow growth rate.

Post-operative CT scans initially showed no evidence of residual or recurrent disease in the retroperitoneum or liver. An oncology opinion was sought with regard to adjuvant therapy. It was decided on balance that chemotherapy and / or radiotherapy was likely to produce little benefit with a high risk of damaging side effects. CT surveillance was instituted at three monthly intervals. She subsequently developed liver metastases although there was no evidence of secretory activity. At the time of writing, twenty months after surgery, she remains clinically well with no symptoms from her disease.

DISCUSSION

With the burgeoning popularity of lumbar spinal arthroplasty, more spine surgeons will use an anterior approach to the lumbar spine with increasing frequency. This is an area that is unfamiliar to many of them and the sorts of pathologies encountered in the paraspinal tissues are usually outside of their experience and training. It is therefore important that spinal surgeons are aware of the clinical approach required to adequately investigate and treat patients in who unexpected pathology is discovered in the retroperitoneum.

The paraganglion system is formed by cells originating from the neural crest and is found throughout the body. These specialised cells store catecholamines within their cytoplasm. The majority of these cells are found in the medulla of the adrenal glands.

Tumours arising in the adrenal medulla are termed pheochromocytomas and extra-adrenal tumours are called

paragangliomas (3, 17).

Paragangliomas occur in many sites such as the larynx, thyroid gland, glomus jugulare, carotid body, lung, mediastinum, duodenum, and para-aortic and retroperitoneal regions. There have been several reports of primary lumbar and thoracic spinal involvement (2, 4, 5, 7, 8, 12, 20), and a single report of symptomatic paraganglioma of the cervical spine (1). The majority of paragangliomas (90%) arise in the carotid bodies or glomus jugulare and can be considered as chemodectomas (6, 8, 10).

Unlike pheochromocytomas, extra-adrenal paragangliomas typically produce no symptoms related to excess hormone or catecholamine production. In patients with secretory tumours the most frequent complaints are headache, sweating, tachycardia or palpitations, chest pain, dyspnoea, and nausea (5). Our patient had no symptoms or signs attributable to her extra-adrenal paraganglioma.

Most paraganglia tumours occur as sporadic unilateral adrenal lesions (pheochromocytomas) but the occurrence of multicentric or familial disease has been reported. Two pheochromocytoma/paraganglioma associated cancer syndromes are multiple endocrine neoplasia type 2 (MEN-2) syndrome and von Hippel-Lindau disease (13).

Retroperitoneal tumours are divided into adrenal (80-90%) and extra-adrenal (10-20%) paragangliomas. Presenting symptoms of patients with retroperitoneal paragangliomas may be back pain or a palpable mass. However, in our case there was sufficient pathology in the two level spondylolisthesis to account for the pre-operative symptoms and the paragangliomas were therefore considered to be asymptomatic pre-operatively. Around 10% will have distant metastases at diagnosis; between 25-60% have functional tumours with symptoms and signs of excessive norepinephrine release. The metastatic potential of retroperitoneal paraganglioma ranges from 20-42%. Retroperitoneal paragangliomas tend to be aggressive, can present with synchronous or metachronous metastases and frequently have bulky tumours (16).

Oncological treatment of paragangliomas is disappointing as these tumours are relatively radio- and chemo-resistant (10, 15) and surgical excision of all involved tissues is the mainstay of treatment. However, the uptake of MIBG has been successfully exploited as a non-surgical treatment in patients with metastatic disease (18). In our patient, the

asymptomatic nature of the disease and toxicity of the potential therapeutic agents meant that chemotherapy was deemed inappropriate. Likewise, a therapeutic dose of radiotherapy to the involved areas would have produced considerable morbidity and was not justified. MIBG therapy was precluded by the non-uptake by the tumour.

CT and MRI, play a major role in detecting paragangliomas before surgery, and provide the best anatomical information. These techniques, however, can fail to detect tumours at sites of previous surgery or locate extra-adrenal tumours. MIBG scintigraphy may detect tumours arising in unusual or unexpected locations. In patients with recurrent disease who are more likely to have malignant and extra-adrenal tumours, MIBG scintigraphy may be the best initial investigation (11, 19).

Extra-adrenal paragangliomas have distinctive histological features and resemble the normal adrenal gland: a highly vascular uniform proliferation of round or polygonal cells arranged in compact Zellballen (9). The correlation between histological features such as nuclear atypia and mitotic rate and disease activity is poor, and therefore using histological features to predict metastatic potential is unreliable (16).

While local recurrence following incomplete resection is not uncommon, the metastatic potential of these tumours is unclear. Different definitions of malignancy may have led to the wide range of malignancy incidence reported in the literature (3-71%) (14). Identification of distant metastasis e.g. to bone, liver, lung and lymph nodes is the only absolute indicator of malignancy (10). Therefore, because of the difficulty in confirming malignancy before the discovery of metastases, all paragangliomas should be regarded as potentially malignant.

CONCLUSIONS

For the increasing number of spinal surgeons who routinely perform anterior approaches to the lumbar spine, this case highlights the need to manage incidental retroperitoneal pathologies appropriately. Abnormal masses must be safely biopsied and the initial planned procedure modified appropriately. In this case there was a possibility that there was an infective process causing the lymph node changes. We took the decision to abandon the planned Carbon UltraPEK interbody cages and bone graft substitute fusion, and used an uninstrumented tricortical iliac crest graft technique.

Prompt histological analysis is required, followed by appropriate staging investigations, in order to make a timely specialist referral for definitive surgical treatment.

ACKNOWLEDGEMENTS

We would like to acknowledge and thank Stryker UK for their support of Mr. Shaw and Mr. Noyes' post as a Clinical Fellow.

CORRESPONDENCE TO

Nick C. Birch FRCS (Orth) Tel: +44 1604 885004 Fax: +44 1604 885004 E-mail: nickbirch@doctors.org.uk

References

1. Blades D, Hardy R, Cohen M. Cervical paraganglioma with subsequent intracranial and intraspinal metastases. *J Neurosurg.* 1991;75:320-323.
2. Bozkurt G, Ziyal I M, Akbay A, et al. Cauda-filar paraganglioma with 'silk cocoon' appearance on spinal angiography. *Acta Neurochirurgica.* 2005; 147 (1): 99 - 100
3. Chatal J. Can we agree on the best imaging procedure(s) for localization of pheochromocytomas? *J Nucl Med.* 1993;34(2):180-181.
4. Ciapetta P, Perrino G, Albrizio M. Functionless non-chromaffin retroperitoneal paraganglioma causing cauda equine compression. *Acta Neurochir (Wien).* 1980;53(3-4):181-186.
5. Gallivan MVE, Chun B, Rowden G, et al. Intrathoracic paravertebral malignant paraganglioma. *Arch Pathol Lab Med.* 1980;104:46-51.
6. Grimley PM, Glenner GG. Histology and ultrastructure of carotid body paragangliomas. *Cancer.* 1967;20:1473-1488.
7. Houten JK, Babu RP, Miller DC. Thoracic paraganglioma presenting with spinal cord compression and metastases. *J Spinal Disord Tech.* 2002;15:319-323.
8. Jeffs GJ, Yin Foo Lee G, Tse-Hwai Wong G. Functioning paraganglioma of the thoracic spine: case report. *Neurosurgery.* 2003;53(4):992-994.
9. Klierer KE, Cochran AJ. A review of the histology, ultrastructure, immunohistology, and molecular biology of extra-adrenal paragangliomas. *Arch Pathol Lab Med.* 1989;113:1209-18.
10. Lamy AL, Fradet GJ, Luoma A, et al. Anterior and middle mediastinum paraganglioma: complete resection is the treatment of choice. *Ann Thorac Surg.* 1994;57:246-248.
11. Maurea S, Cuocolo A, Reynolds JC, et al. Iodine-131-Metaiodobenzylguanidine scintigraphy in paragangliomas: comparison with CT and MRI. *J Nucl Med.* 1993;34:173-179.
12. Naim-ur-Rahman, Saddiq S, Jamjoom ZA. Paraganglioma of the cauda equina: a case report and review of the literature. *Br J Neurosurg.* 1991;5(4):409-415.
13. Neumann HPH, Berger DP, Sigmund G, et al. Pheochromocytomas, multiple endocrine neoplasia type 2, and von Hippel-Lindau disease *N Engl J Med.* 1993;329(21):1531-1538
14. Noorda RJP, Wuisman PIJM, Kummer AJ, et al. Nonfunctioning malignant paraganglioma of the posterior mediastinum with spinal cord compression. *Spine* 1996;21(14):1703-1709.
15. Ogawa J, Inoue H, Koide S, et al. Functioning paraganglioma in the posterior mediastinum. *Ann Thorac Surg.* 1982;33:507-510.
16. Patel SR, Winchester DJ, Benjamin RS. A 15-year experience with chemotherapy of patients with paraganglioma. *Cancer.* 1995;76(8):1476-1480.
17. Pick L. Das ganglioma embryonale sympatheticum (sympathoma embryonale) eine bösartige Geschwulstform des sympathetischen nervensystem. *Verhandl Berl Klin Wchnsch.* 1912;49:16-22.
18. Sisson JC, Shapiro B, Beierwaltes WH. Radiopharmaceutical treatment of malignant pheochromocytoma. *J Nucl Med.* 1984;24:197-206.
19. Smit AJ, Van Essen LH, Hollema H, et al. Meta-[I-131]Iodobenzylguanidine uptake in a nonsecreting paraganglioma. *J Nucl Med.* 1984;25:984-986.
20. Sonneland PRL, Scheithauer BW, Lechago J, et al. Paraganglioma of the cauda equina region. *Cancer* 1986;58:1720-35.

Author Information

David Noyes, MRCS

Stryker Clinical Fellow, BMI Three Shires Hospital

Matt Shaw, MRCS

Stryker Clinical Fellow, BMI Three Shires Hospital

Nick C. Birch, FRCS (Orth)

Consultant Spinal Surgeon, BMI Three Shires Hospital