

Acknowledgements

We thank Rod Wolstenholme, graphic designer, for his valuable support in providing the illustrations.

References

- Allen RJ, Treece P. Deep inferior epigastric perforator flap for breast reconstruction. *Ann Plast Surg* 1994;32:32–8.
- Blondeel PN, Boeckx WD. Refinements in free flap breast reconstruction: the free bilateral deep inferior epigastric perforator flap anastomosed to the internal mammary artery. *Br J Plast Surg* 1994;47:495–501.
- Blondeel PN, Vanderstraeten GG, Monstrey SJ, et al. The donor site morbidity of free DIEP flaps and free TRAM flaps for breast reconstruction. *Br J Plast Surg* 1997;50:322–30.
- Blondeel PN. One hundred free DIEP flap breast reconstructions: a personal experience. *Br J Plast Surg* 1999;52:104–11.
- De Weerd L, Weum S. The butterfly design: coverage of a large sacral defect with two pedicled lumbar artery perforator flaps. *Br J Plast Surg* 2002;55:251–3.
- Roche NA, Van Landuyt K, Blondeel PN, Matton G, Monstrey SJ. The use of pedicled perforator flaps for reconstruction of lumbosacral defects. *Ann Plast Surg* 2000;45:7–14.
- Kato H, Hasegawa M, Takada T, Torii S. The lumbar artery perforator island flap: anatomical study and case reports. *Br J Plast Surg* 1999;52:541–6.
- Ao M, Mae O, Namba Y, Asagoe K. Perforator-based flap for coverage of lumbosacral defects. *Plast Reconstr Surg* 1998;101:987–91.
- Kroll SS, Rosenfield L. Perforator-based flaps for low posterior midline defects. *Plast Reconstr Surg* 1988;81:561–6.
- Blondeel PN, Demuyneck M, Mete D, et al. Sensory nerve repair in perforator flaps for autologous breast reconstruction: sensational or senseless? *Br J Plast Surg* 1999;52:37–44.
- Isenberg JS. Sense and sensibility: breast reconstruction with innervated TRAM flaps. *J Reconstr Microsurg* 2002;18:23–8.

The Authors

Louis de Weerd MD
Odd Petter Elvenes MD, PhD
Eivind Strandenes MD

Department of Plastic Surgery and Hand Surgery,

Sven Weum MD

Department of Radiology,

University Hospital of Tromsø, 9038 Tromsø, Norway.

*Correspondence to Mr Louis de Weerd

Paper received 19 April 2002.

Accepted 22 January 2003.

British Journal of Plastic Surgery (2003), **56**

© 2003 The British Association of Plastic Surgeons. Published by Elsevier Science Ltd. All rights reserved.

doi:10.1016/S0007-1226(03)00036-5

Intraneural ganglion cysts: a case of sciatic nerve involvement

Kartik G. Krishnan and Gabriele Schackert

Department of Neurological Surgery, Carl Gustav Carus University Hospital, Technical University of Dresden, Fetscherstrasse 74, D-01307 Dresden, Germany

SUMMARY. The pathogenesis of intraneural ganglion cysts is unknown. Some authors have established a connection between the cysts and the joint, while others have failed to find this communication. Most intraneural ganglion cysts occur in the proximity of a joint. We present the case of a 53-year-old Caucasian male with an intraneural cyst of the sciatic nerve located high above its bifurcation and without a connection to the joint. The lesion was microsurgically removed in toto. There was no recurrence of the cyst at follow-up 9 months postoperatively; complete resolution of the clinical symptoms occurred within 8 months of surgery. This case shows that ganglion cysts can occur in locations far from a joint, supporting the extra-articular embryonic synovial remnant theory of their genesis. © 2003 The British Association of Plastic Surgeons. Published by Elsevier Science Ltd. All rights reserved.

Keywords: intraneural ganglion cyst, surgical management, sciatic nerve, MRI.

Intraneural ganglion cysts have been reported to communicate with a neighbouring joint,¹ but there are also publications suggesting the contrary.² Hypotheses regarding the pathogenesis of intraneural ganglion cysts include: metaplastic transformation of traumatic intra-epineural microhaemorrhage, degenerative changes occurring in the nerve sheath as a result of chronic irritation, loculation of intraneurally entrapped extra-articular embryonic synovial remnants, and ingrowth of an articular cyst into the nerve.

We report a case of an intraneural cyst presenting atypically in the sciatic nerve in the distal third of the thigh, well above the bifurcation of the nerve. Neither MRI nor surgical exploration established a connection to the articular space.

Case report

The patient was a 53-year-old roof-worker. For about a year he

had been experiencing intermittent pain and numbness in his great and second toes, and lately he had started to develop persistent paresis of the leg muscles. On examination, the patient complained of radiating pain and numbness along the back of his leg, reaching the sole of his foot, when the posterior thigh was palpated. An M3 motor paresis of both ankle dorsiflexors and plantar flexors was noted. Tinel's sign could be elicited at the back of the mid-thigh. Electromyography of the flexors and extensors did not show fibrillations or positive sharp waves. A latency in the conduction velocity of the sciatic nerve of 12 m s^{-1} was noticed across the distal thigh region. MRI showed a space-occupying lesion along the course of the sciatic nerve in the mid-thigh region (Fig. 1).

Surgery was conducted under general anaesthesia and magnification. The epineurium of the affected portion of the sciatic nerve was found to be thin and translucent in several places, revealing clear fluid content. Clear thick gelatinous semisolid material was present in several loculated cysts, and a portion of the lesion consisted of solid fibrous tissue. Fascicular neurolysis was undertaken through a longitudinal epineurotomy, thereby, separating and preserving the healthy fascicular structures (Fig. 2). Under light microscopy, spindle-shaped myxoid elements (solid component) could be seen near cystic structures composed of thickened collagenous connective tissue (cystic element). The cyst wall was irregularly lined with squamous-type cells (secretory component of the cysts). The findings were consistent with a nerve-sheath ganglion with myxoid degenerative changes.

The radiating pain disappeared immediately after surgery. The sensation in the affected areas of the foot returned to normal after 5 months, and motor strength returned to the M5 level within 8 months under intensive physical therapy. The lesion did not reappear in MRI scans carried out 6 months and 9 months after surgery (Fig. 3).

Discussion

The pathogenesis of intraneural ganglion cysts has been debated for decades, while that of extraneural ganglia is more accepted.¹ Some intraneural cysts recur after surgical excision, possibly owing to a remnant communication with the adjacent articular space, whilst other cysts disappear after intervention.² The commonality in all ganglion cysts seems to be their proximity to a joint. The origin of a ganglion cyst is suggested to be a sac growing out from the synovial membrane. The absence of a connection with the articular space in at least some reported intraneural cysts has led to the belief that they arise from embryonic synovial remnants or are caused by degenerative changes in the nerve sheath as a result of chronic irritation. The peroneal nerve is the most susceptible,^{2,3} although occurrence in various other nerves has been noted.²⁻⁷

The diagnostic work-up includes clinical examination, electrophysiology and imaging. The ganglion cyst does not always present as a palpable mass. Tinel's sign, with or without pain, is present in all cases. Electromyography and electroneurography may indicate denervation and conduction latency, respectively. MRI is the method of choice for obtaining high-resolution images of soft-tissue lesions.^{3,4} Ultrasonography is an inexpensive and non-invasive additional investigation.⁸

Some authors have proposed aggressive radiological work-up regimes, such as arthrography, especially in

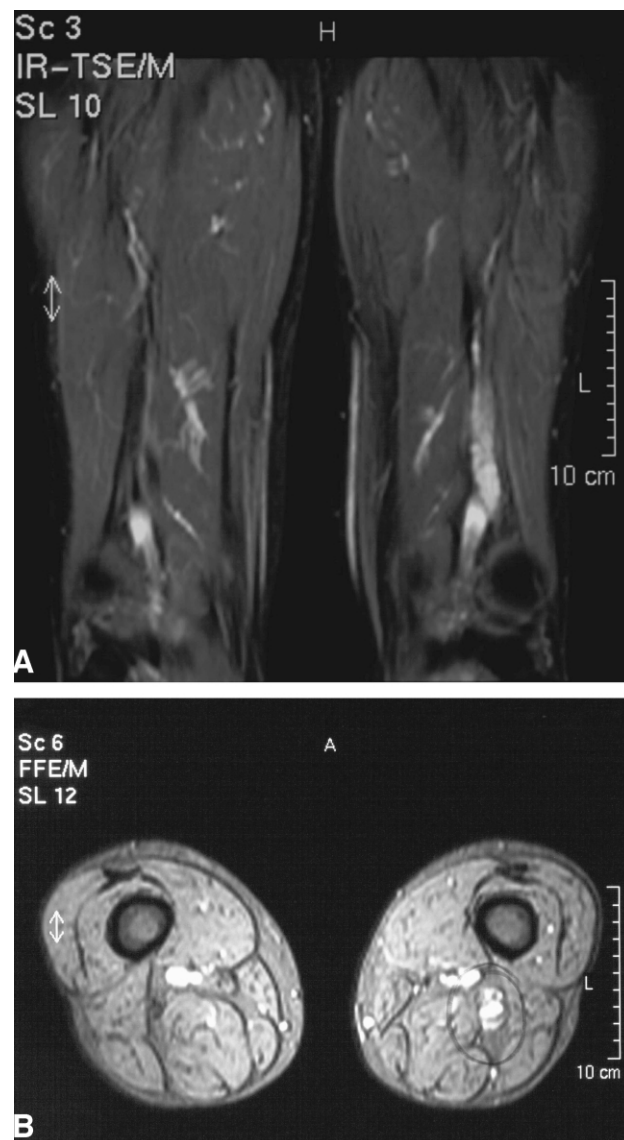


Figure 1—Preoperative (A) coronal and (B) axial MRI slices showing the space-occupying lesion of the left sciatic nerve with fluid content.

cases of recurrence, in order to establish a connection to the joint space.³ Careful microsurgical exploration during surgery should reveal such connections. Thus, diagnostic arthrography should be reserved for highly doubtful cases of recurrence.

Surgical exploration and excision is the method of choice in treating space-occupying lesions of the peripheral nerves. There are three goals of this surgical procedure: to remove the intraneural ganglion cyst and its secretory components (cyst wall); to destroy any possible connection to an adjacent articular space and, most importantly, to preserve as many functionally intact nerve fascicles as possible. Tatagiba et al proposed emptying the cysts through an incision on the capsule, in order to preserve function.⁹ With this technique the secretory lining of the cyst is left in situ; thus, the possibility of recurrence is not excluded.

Based on our study of the literature, some general points about intraneural ganglion cysts may be made:

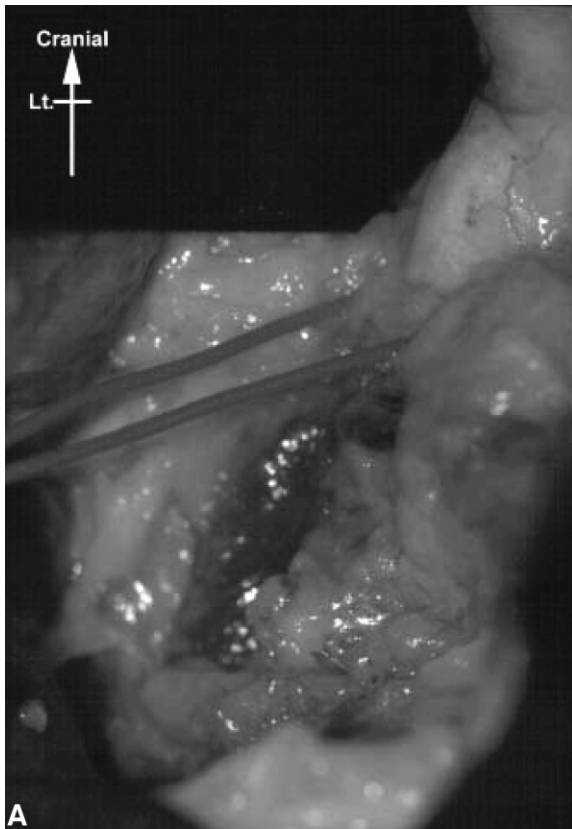


Figure 2—(A) Exposure of the nerve with the cyst. Note the thin-walled epineurium revealing translucent fluid content. (B) Fascicular neurolysis was carried out, separating the nerve structures from those of the lesion. Radical removal of the cyst was possible.

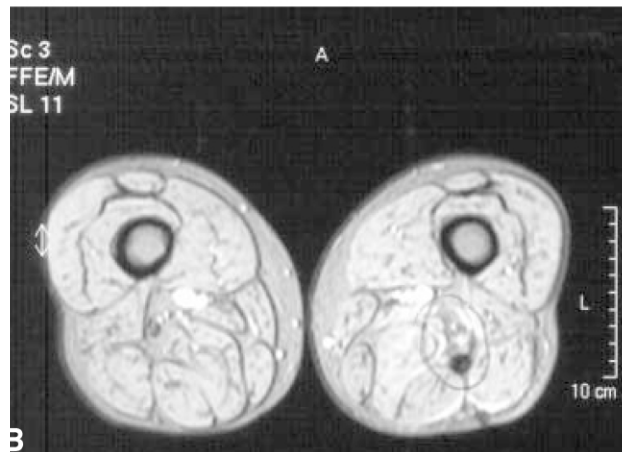


Figure 3—MRI 9 months postoperatively. The cyst did not recur. The patient was asymptomatic.

- (1) during a diagnostic work-up, the possibility of an intraneural ganglion cyst should not be excluded, regardless of whether the lesion is in the proximity of a joint or of the nerve involved; the lesion is often associated with the common peroneal nerve;
- (2) microsurgical exploration and excision is the most effective method of treatment;
- (3) primary microsurgical exploration of lesions adjacent to joint spaces should involve a search for a possible peduncular connection to the articular space.

To our knowledge, the occurrence of intraneural ganglion cysts does not show a pattern and is not associated with other conditions.

Acknowledgements

We thank Kristin R. Hanson for editing the language.

References

1. De Maeseneer M, De Boeck H, Shahabpour M, Hoorens A, Oosterlinck D, Van Tiggelen R. Subperiosteal ganglion cyst of the tibia. A communication with the knee demonstrated by delayed arthrography. *J Bone Joint Surg* 1999;81B:643–6.
2. Ferlic DC, Ries MD. Epineural ganglion of the ulnar nerve at the elbow. *J Hand Surg* 1990;15A:996–8.
3. Spinner RJ, Atkinson JL, Harper Jr CM, Wenger DE. Recurrent intraneural ganglion cyst of the tibial nerve. Case report. *J Neurosurg* 2000;92:334–7.
4. Jaradeh S, Sanger JR, Maas EF. Isolated sensory impairment of the thumb due to an intraneural ganglion cyst in the median nerve. *J Hand Surg* 1995;20B:475–8.
5. Faivre J. Ganglion cyst of the spinal canal. *J Neurosurg* 1982;57:867.
6. Fischer BW, Crosby LA. Ganglion cyst of the shoulder with suprascapular nerve involvement. *Nebr Med J* 1995;80:171–3.
7. Hermansdorfer JD, Greider JL, Dell PC. A case report of a compressive neuropathy of the radial sensory nerve caused by a ganglion cyst at the elbow. *Orthopedics* 1986;9:1005–6.
8. Leijten FS, Arts WF, Puylaert JB. Ultrasound diagnosis of an intraneural ganglion cyst of the peroneal nerve. Case report. *J Neurosurg* 1992;76:538–40.
9. Tatagiba M, Penkert G, Samii M. Ganglia of peripheral nerves. *Zentralbl Neurochir* 1993;54:171–3. in German.

*Correspondence to Kartik G. Krishnan

Paper received 6 October 2002.

Accepted 22 January 2003.

British Journal of Plastic Surgery (2003), **56**

© 2003 Published by Elsevier Science Ltd on behalf of The British Association of Plastic Surgeons
doi:10.1016/S0007-1226(03)00031-6

Appropriateness of MRI scanning in the detection of ruptured implants used for breast reconstruction

Adam Topping, Christopher George* and Geoffrey Wilson†

*St George's Hospital, London, UK; *Epsom Hospital, Surrey, UK; and †Chelsea and Westminster Hospital, London, UK*

SUMMARY. This case report highlights the problems associated with ruptured silicone breast implants used for breast reconstructive purposes. The patient originally presented with vague symptoms and signs to her GP and was extensively investigated over a period of years for left-sided chest/abdominal pain. Two separate scanning modalities were used prior to her being seen by either of the main authors and although none were employed specifically to assess for implant rupture, neither detected any free silicone around the hemithorax. The authors suggest that patients who have undergone breast reconstruction with a silicone implant may present in a manner not suggestive of implant damage. In such cases, where the silicone can extend over larger anatomical distances and where side-effects can be damaging the investigation of choice should be MRI scanning which has a greater accuracy for detecting free silicone and defining the extent of spread. © 2003 Published by Elsevier Science Ltd on behalf of The British Association of Plastic Surgeons

Keywords: silicone implants, breast reconstruction, implant rupture, scanning modalities, accuracy.

Introduction

The management of ruptured silicone breast implants has been discussed in the literature and although MRI scanning is the gold standard for identifying free silicone exteriorised from an implant,¹ the cost and in some instances the wait for such an investigation may be prohibitive. As a consequence ultrasound scanning has been advocated as the most cost effective technique of determining whether or not an implant has ruptured whilst acknowledging reduced sensitivity and specificity.² The authors present a case of a ruptured silicone implant in a patient who had undergone breast reconstruction with a pedicled latissimus dorsi myocutaneous flap and implant. Suspicion of implant rupture

is advised, even with apparently unrelated clinical manifestations. The authors advocate the use of MRI scanning as the first line of investigation in patients who have undergone a breast reconstructive procedure. The technique has been shown to be more accurate for determining the presence and extent of silicone leakage so aiding surgical removal and potentially reducing patient morbidity.

Case report

The patient with carcinoma of the left breast at the age of 32 underwent a radical (Halstead) mastectomy in 1975. Ten years later she underwent a left latissimus dorsi myocutaneous flap with silicone breast implant reconstruction and made an