Iatrogenic intraspinal epidermoid tumours secondary to lumbar puncture are well documented in the literature, at least 60 cases having been reported.\textsuperscript{1-12} The etiologic relation has been well established since the original description, by Choremis and associates.\textsuperscript{13} Despite this, articles have appeared that advocate the use of needles without stylets for reasons of simplified technique.\textsuperscript{14,15} Others have described the technique without any reference to the use of a stylet.\textsuperscript{16} Since then a number of authors\textsuperscript{5-10,17} have described epidermoid tumours due to the use of unstyletted needles and have advised against this practice.

Those reports have for the most part appeared outside of the pediatric literature, and thus pediatricians may not have been aware of the important relation between lumbar puncture and the development of epidermoid cysts. It has been our experience, as well as that of others,\textsuperscript{9} that the performance of lumbar puncture with unstyletted needles is still common in newborns and young infants. We believe that although the use of such needles seems to facilitate spinal puncture in certain situations, particularly in newborns, the risk of epidermoid tumours and their inherent complications has not been appreciated.

In this article we describe our recent experience with iatrogenic intraspinal epidermoid tumours and discuss the role of spinal puncture in their pathogenesis as well as preventive measures.

Case reports

Case 1

A 27-day-old boy had been admitted to hospital because of septicemia and had undergone three lumbar punctures, all of which had been bloody. The type of needle used had not been documented, but unstyletted needles were known to have been preferred by certain physicians performing this procedure on newborns.

At 11 years of age the boy presented with a 3-week history of back pain radiating to the buttocks and extending posteriorly to the calves. Physical examination revealed bilateral paraspinal muscle spasm. He could not flex at the waist more than 30°, and mild lumbosacral scoliosis was noted. He was unable to straighten his legs because of increased hamstring muscle tone and walked with his knees slightly flexed.

Radiographs of the thoracic and lumbar regions of the spine were normal. Myelography revealed an almost completely obstructing intradural mass at the level of the third lumbar vertebra that had an irregular, whorled surface superiority. Computed tomography (CT) showed that the lesion lay posteriorly in the dural sac and did not contain any appreciable amount of fatty tissue. The pathological features indicated an epidermoid cyst.

The tumour was resected. The patient's recovery was unremarkable, and he was discharged home asymptomatic.

Case 2

At 2 days of age a girl had been admitted for investigation of hypocalcemia and had undergone two lumbar punctures, one of which was traumatic. Again, the type of needle used had not been described.

The girl presented at 5½ years of age with a 9-month history of intermittent low back pain. Enuresis had developed 5 months before admission. Paraspinal muscle spasm and loss of normal lordosis were noted. Forward bending was severely limited. Straight-leg raising was hindered because of contraction of the hamstring muscles. Findings at neurologic examination were normal except for Babinski's reflex on the right side.

Radiography and CT scanning of the thoracic and lumbar regions of the spine gave normal
findings. Myelography revealed an intradural mass, 2 cm in diameter, between the second and third lumbar vertebrae that did not obstruct the flow of contrast medium (Fig. 1). The pathological features indicated an epidermoid cyst with marked keratin formation. The tumour was resected, and the patient was discharged without symptoms.

The girl was readmitted 3½ years later with a 3-week history of back pain. Her nocturnal enuresis had increased in frequency with the onset of the pain. Radiography of the lumbosacral region revealed signs of laminectomy between the second and third lumbar vertebrae, and myelography showed an obstructing intradural lesion at the level of the third lumbar vertebra.

A recurrent epidermoid cyst was diagnosed and was removed except for a small remnant of the capsule that adhered to the cauda equina. The patient had an excellent postoperative recovery and was discharged home with no neurologic deficits, although the enuresis continued.

**Comments**

Epidermoid tumours are represented histologi-

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*Fig. 1 — Anteroposterior and lateral views of spine, showing intradural mass between second and third lumbar vertebrae in 5½-year-old girl who had undergone lumbar puncture at 2 days of age.*
cally by a mass of desquamated cells containing keratohyalin encased within a laminated capsule of well-differentiated stratified squamous epithelium. Pathogenetically these tumours may be secondary to congenital development or iatrogenic implantation. The congenital tumours are associated with spinal malformations such as spina bifida and other dysraphic states, changes due to intraspinal erosive pressure that can be observed on plain radiographs and a greater tendency to develop in intramedullary and thoracic spinal locations. The iatrogenic tumours result from direct introduction of epidermal tissue into the spinal canal through hollow or poorly fitting styleted needles.

Gibson and Norris19 were able to remove solid fragments of tissue in a substantial proportion (69%) of cases in which hollow needles were used to penetrate the skin. They found that styleted needles did not remove skin fragments as long as the stylet was well fitted. Van Gilder and Schwartz20 were able to produce intraspinal epidermoid tumours in rats by implanting skin homografts into the epidural or subarachnoid space. Brock-Utne and colleagues,21 while studying intrathecal analgesics, reported the introduction of a hair follicle into the subarachnoid space in a baboon after spinal puncture with a 23-gauge hollow needle.

Epidermoid tumours are uncommon lesions, having constituted fewer than 1% of intraspinal tumours in earlier studies. The incidence and probably the actual frequency of intraspinal epidermoid tumours have increased, possibly because of better understanding and awareness of the lesion but also because of more aggressive approaches to the management of sepsis and the frequent use of lumbar puncture.

Brockey and Schorstein2 pointed out the uniformity of symptoms and signs, particularly low back pain and rigidity, among children. In case 2 enuresis developed coincident with the appearance of an epidermoid tumour; bladder dysfunction has been reported previously.10

Surgical removal of these lesions has long been recognized as difficult.18,22 Most of the reports have not mentioned a significantly long follow-up; however, there is a definite risk for recurrence if surgical resection is difficult.

Central to the issue is the performance of lumbar puncture with an unstyleted needle or a needle with a poorly fitting stylet. The ease with which the unstyleted needle affords entry into the subarachnoid space is overshadowed by the risk of epidermoid tumour. Obtaining styleted needles of a sufficiently small gauge to use in pediatric work is not a problem. Disposable needles up to 26 gauge in diameter and 8.9 cm in length with stylets are available (Becton Dickinson and Company, Rutherford, New Jersey). Some authors have advocated a method for spinal puncture in which the stylet is removed after passing through the epidermis and dermis;10,23 the hollow needle is then carefully advanced until cerebrospinal fluid is encountered. Theoretically this should decrease the risk of tumour, but experiments similar to those of Gibson and Norris19 and further clinical experience with the technique are needed to validate this hypothesis. Until this is done we can presume that there is a relation between the use of needles without stylets or with poorly fitting stylets and intraspinal epidermoid tumours. Such needles should not be used for lumbar puncture.

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References

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