An unusual complication of Dura Film as a dural substitute

Report of two cases

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Two cases are presented in which the patients developed an unusual complication following the use of an artificial dural substitute, silicone-coated Dacron (Dura Film). Both patients had undergone removal of a tumor and involved dura. The first patient developed a very thick connective-tissue capsule of the graft material which simulated a recurrent tumor. The second patient developed an acute hemorrhage initially thought to be an acute subdural hematoma beneath the artificial dura 9 weeks after tumor removal and implantation of the graft. A review of the literature and proposed mechanisms of these complications are presented.

KEY WORDS • dural substitute • brain tumor • neomembrane • subdural hematoma

Of the materials in use today for duraplasty,5 silicone-coated Dacron has gained wide acceptance. Lee, et al.,6 recommended silicone-coated Dacron as an ideal substitute for dura because of minimal tissue reactions in animal studies. In 50 craniotomy cases, Collis and Meier7 found little, if any, foreign-body reactions with its use. On the other hand, silicone-coated Dacron is the only synthetic material used clinically that has been reported in the literature to be associated with an unusual complication.1,2

In our experimental studies on spinal duraplasty, the application of silicone-coated Dacron (Dura Film) resulted in unfavorable results.5 We are now reporting unusual complications following removal of meningiomas in two patients in whom silicone-coated Dacron was used to repair cranial dural defects.

Case Reports

Case 1

This 73-year-old woman was admitted to The Christ Hospital in January, 1976, because of recurrent right-sided weakness and unsteadiness of gait of 3 months' duration. During her first admission to this hospital in May, 1970, a 2-year history of progressive recent-memory loss, headache, and behavioral and personality changes was obtained. For 8 months, she noted progressive weakness of her right leg and hand, causing her...
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Fig. 2. Case 1. A: Photograph of the fibrous tissue mass enveloping the dural substitute. B: The internal surface of the outer fibrous tissue capsule showing a collection of reddish-brown material identified as old blood clot.

to fall on several occasions. A left frontoparietal meningothelial meningioma was completely resected, together with the overlying dura. The dural defect was repaired in a watertight closure with Dura Film. The patient recovered and remained well until November, 1976, when her symptoms recurred.

Examination. Neurological examination revealed memory impairment, right hemiparesis, and hyperreflexia on the right side. The bone flap was in place. Electroencephalography revealed left frontal slowing, and a left frontal mass lesion was demonstrated by radioisotope brain scanning. A high-density lesion over the left frontal region was identified on computerized tomography (CT) scanning (Fig. 1).

Operation. Exploration through the previous left frontal craniotomy site exposed a bulging fibrous tissue mass enveloping the dural graft. The dura was opened around the perimeter of the mass. Although firmly adherent to the dura mater and depressing the brain by 2.5 cm, the mass did not invade the brain. The mass was comprised of thickened fibrous tissue separated by the graft. A cleavage plane between the two fibrous masses was easily established. Between the outer layer of connective tissue and the graft was a collection of reddish-brown material identified as an old blood clot (Fig. 2). The dural defect was repaired using peri-cranium.

Postoperative Course. The patient was discharged 9 days after surgery. She was free of headache and was ambulatory, with marked improvement of her right hemiparesis.

Pathological Examination. Examination of the specimen revealed a 6 × 4.6-cm mass with two layers of fibrous tissue and a piece of synthetic graft lying between. The outer “epidural” layer was 0.7 cm thick, with a reddish-brown material on its inner surface. The layer beneath the synthetic graft was 0.4 cm thick, with a roughened surface. Microscopic examination revealed a sclerosed and hyalinized fibrous scar with focal chronic inflammatory infiltrate and calcification, with eosinophilic and amorphous material (Fig. 3).

Case 2

This 34-year-old woman presented to The Christ Hospital in April, 1979, in a comatose state. Nine weeks prior to this admission, a left frontal craniotomy had been performed for the removal of a meningioma (hemangioblastic type). The dural defect, measuring 7.5 × 5.5 cm, was repaired with the use of silicone-coated Dacron in a watertight closure. The patient’s postoperative course was uneventful and on the 11th postoperative day she was discharged asymptomatic. She remained in good health until 2 days prior to this second admission, when she developed a sore throat and headache. Twenty-four hours later she developed dysarthria.

Fig. 3. Case 1. Histological section of the fibrous tissue mass. A sclerosed and hyalinized fibrous scar is observed in the upper portion of the field, while an infiltrate with capillaries is identified in the area closest to the graft. H & E. × 80; Bar = 100 μ.
right hemiparesis, and vomiting. She then suffered expressive dysphasia and immediately became comatose. No history of head trauma was elicited.

Examination. On admission the patient was unconscious. The previous left frontal craniotomy site was well healed and the bone flap appeared to be in place. The neck was supple. Both pupils were equal and reactive to light. She had bilateral papilledema, a right hemiparesis, and a Babinski sign. X-ray films of the skull demonstrated the operative defect with the bone flap in place. A CT scan revealed an area of increased density, measuring 8 to 10 mm in diameter, over the left frontoparietal area both before and after administration of contrast material (Fig. 4). Selective left carotid angiography disclosed extensive displacement of the anterior cerebral artery across the midline to the right.

Operation. The previous left frontal craniotomy site was explored. The underlying silicone-coated Dacron was tense and dark blue in color. This was opened and a bulging hematoma containing approximately 55 cc of relatively fresh blood clot was evacuated. A gliotic layer partially adherent to the brain was dissected free. There was an area of gliosis within the tissue overlying the surface of the brain. Hemostasis was obtained and the dura was closed.

Postoperative Course. On awakening from surgery, the patient had regained her normal speech, and the right hemiparesis had improved. She was discharged 1 week later.

Pathological Examination. Microscopic examination revealed a hematoma encapsulated by a fibrous membrane (Fig. 5). There were indications of chronic inflammation and siderosis.

Discussion

The neurological deficits of these two patients in whom silicone-coated Dacron had been applied for duraplasty were directly associated with this graft material. Both patients presented with focal signs. The first case simulated a slowly growing recurrent tumor, with symptoms appearing 4 years following the patient's initial operation for meningioma. The proliferation of connective tissue had encapsulated the graft and led to progressive compression of the brain parenchyma, simulating recurrent tumor. This phenomenon has not been reported previously. In the second case, the symptoms developed more rapidly. The CT scan and operative findings confirmed the presence of a subdural hemorrhage.

Banerjee, et al., postulated that chronic subdural hematoma following the use of Silastic dural substitute was due to hemorrhage into the space between neomembranes encapsulating the graft. Although connective tissue surrounds the graft, it is only loosely adherent and this does not change over time. The blood supply to the neomembranes was believed to be from epidural veins. Because of the fragile association between the connective-tissue capsule and the Silastic material, rather minor trauma, such as sudden jerky movements, might injure the veins, resulting in progressive hematoma formation. The slow accumulation of blood is thought to be due to the hematoma being of a venous origin. More recently, Adegbite, et al., reported the
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development of a hematoma between the connective-tissue capsule (neomembrane) and Silastic dural substitute. Referring to studies of the formation of subdural neomembranes, these authors postulated that the neomembranes which are associated with fragile sprouting capillaries have a tendency to undergo repetitive multifocal bleeding. Regardless of the mechanism, all of the reported cases with subdural hematoma had a collection of blood between the neomembrane and the Silastic dural graft.1,2

In view of our clinical experience as well as that of others,1,2 and our experimental results,3 we believe the application of silicone-coated Dacron as a dural substitute should, as previously suggested,7 be used with caution.

References

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