overlain the cauda equina, have had a better prognosis, and have presumably caused their neurological signs by compression.

In the former group, no differential point is found that might distinguish a subdural from an epidural abscess; its presence can only be suspected preoperatively. In the latter, it appears that the diagnosis can be made by careful lumbar puncture.

In both instances treatment should be an emergency laminectomy and drainage of the purulent subdural contents.

REFERENCES


15. Stevenson, D. L. Personal communication.


TANTALUM CRANIOPLASTY AND REPEATED TRAUMA

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There is uniform agreement that protection from trauma constitutes one of the major indications for cranioplasty. The necessity for such protection is greatest in the younger age group and increases with the size of the cranial defect.

Tantalum is probably the most commonly employed alloplastic material used for this purpose and while generally the thickness of plate employed has been sufficient to withstand considerable direct trauma, there has been some recent tendency to

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use thinner sheets because of the facility with which the prosthesis may be formed to correspond to the contour of the skull. Weiford and Gardner, in a recent review of 106 cases of tantalum cranioplasty, indicated that the thickness of the sheets employed had been reduced in successive stages from 0.020 to 0.007 inch and felt that the latter was of sufficient strength, was more easily and more accurately fashioned, and was less expensive. Gardner noted that with tantalum sheet of 0.007 inch thickness, pneumoencephalography and arteriography could be done with adequate visualization of the air-filled ventricles or of diodrast-filled vessels.

Deformity of a tantalum implant due to trauma probably occurs more often than one would suspect from the infrequency with which it is mentioned in the literature. Lane and Webster in 1947 mentioned the necessity for removal of a tantalum implant because of an abscess of the scalp after a blow at the site of a cranioplasty 11 months after the procedure had been done for a gunshot wound. In a recent review by Reeves, no mention is made of this complication.

The following instance of gross deformity of a tantalum implant due to repeated trauma served to stimulate observations relative to the ability of various sizes and various thicknesses of tantalum plate to withstand direct trauma.

**CASE REPORT**

The patient was an 8-year-old boy, first seen on April 11, 1950, because of a compounded and comminuted fracture of the frontal region sustained when he was struck by an iron pipe. The fracture overlay the anterior portion of the superior longitudinal sinus and indriven bone fragments could be visualized radiologically at a depth of 2 cm. The comminuted area measured about 5.5 cm. in width with the central portion of the depression at the midline. The patient was in mild shock but there was no evidence of extensive intracranial damage.

Operative debridement was carried out and a 6 to 7 cm. tantalum plate of 0.007 inch thickness was used to cover the defect in the bone. No attempt was made to inlay the plate, which was fixed in position with several tantalum wedges driven through the outer table of the skull into the diploic space. The wound healed well and the patient was discharged from the hospital with no evidence of residual neurologic defect.

The patient was seen on July 15, 1950, because of a deformity of the scalp at the site of the tantalum implant. On July 4, 1950, almost 3 months after discharge from the hospital, he had been struck in the frontal region by a steel helmet of the type worn by steel workers. The patient had not been unconscious from the blow and had no complaint other than some tenderness at the site of the injury. Examination revealed a 3 1/2 cm. long depression of 6 to 7 mm. depth at the site of the cranioplasty. There were no neurologic abnormalities. Because the depression was not marked and in the absence of any apparent neurologic disturbance, replacement of the implant was deferred.

He was not seen again until June 1951, about 1 year after the first injury that had resulted in deformity of the tantalum plate. At this time there was a more marked deformity at the site of the implant and he gave a history that about 3 to 4 weeks previously he had been struck in the frontal region with a baseball. The distortion was more marked and the entire implant appeared to have been badly depressed. On June 16, 1951, the implant was removed (Fig. 1) and replaced with another of 0.015 inch thickness. At operation there was no evidence of damage to the local tissue as a result of the repeated trauma.

Observations were made on the ability of formed tantalum plates to withstand direct impact, using implants of approximately 2, 3, and 4 inch diameter and 0.005, 0.007, 0.010 and 0.015 inch thickness. All plates had the same relative contour and had been hand-formed on the anvil described in a previous communication. Figures were obtained by allowing a quarter-pound weight to drop from a specified height onto the plate, which was fixed in a manner similar to that used in a tantalum cranio-