The trapped distal shunt catheter: removal by graded skin traction

Case report and technical note

ROBERT MORANTZ, M.D., GEUN KIM, M.D., AND FRED EPSTEIN, M.D.
Departments of Neurosurgery and Surgery, New York University Medical Center, New York, New York

A hydrocephalic patient had a distal shunt catheter impacted in the heart which could not be removed by the usual surgical means. A technique of graded skin traction was used to remove the catheter successfully.

KEY WORDS - hydrocephalus - shunt revision - distal end - cardiac arrhythmia - skin traction

As the treatment of hydrocephalus with ventriculoatrial shunts becomes more universal, reports of complications associated with this procedure appear with increasing frequency. The most common complications are obstruction and sepsis. More rarely, catheter embolization, cardiac perforation, and superior vena cava occlusion have been reported as distal catheter complications. We have recently encountered a patient with an infected ventriculoatrial shunt whose distal catheter was trapped in the atrial wall. While this complication has not been reported in the neurosurgical literature, a similar condition has been described with the use of transvenous cardiac pacemakers. A method of graded skin traction that had previously been used to remove impacted cardiac pacemakers was successfully used, thereby obviating the necessity of cardiotomy in this septic child.

Case Report

This 14-year-old girl first developed headaches, nausea, and vomiting at the age of 7½ years. An exploratory craniotomy was done in Belgrade, Yugoslavia, in November, 1965. This revealed only diffuse arachnoidal adhesions and she therefore had a ventriculo-audiculostomy performed in March, 1966.

Examination. On admission to Bellevue Hospital in November, 1971, she appeared chronically ill with slight left-sided weakness and a left Babinski sign. An obviously infected area of scalp was seen surrounding an exposed Pudenz pump in the right occipital area. Her temperature was 101°F, hematocrit 25%, white blood cell count 7150, and sedimentation rate 65. Local wound culture and four blood cultures grew Staphylococcus epidermis. A lumbar puncture revealed clear fluid under normal pressure with 400 red blood cells and 4 lymphocytes. Cerebrospinal fluid (CSF)
Robert Morantz, Geun Kim and Fred Epstein

protein was 270 mg% and glucose was 68 mg%. CSF culture was negative. Chest x-ray films revealed the cardiac catheter to be in the right atrium, the tip being seen at the lower level of the T-6 vertebra. She was immediately started on high doses of intravenous Methicillin.

Operation. The proximal catheter was recovered without difficulty and she was then placed on ventricular drainage through a right frontal burr hole. The previous neck incision was opened, the internal jugular vein isolated and opened, and the distal catheter separated from surrounding fibrous sheaths. Traction was then applied to this catheter but it could not be dislodged from the heart. Ever increasing tension was used until the anesthesiologist indicated that coincident with our tugging, the patient was experiencing premature ventricular contractions. The arrythmia would remit when we stopped applying tension to the distal catheter. The catheter was therefore divided, the proximal end removed and the distal end marked with long sutures. The procedure was well tolerated. Culture of the pump and proximal tubing revealed Staphylococcus epidermis.

At this point our colleagues from the department of cardiovascular surgery suggested a trial of graded skin traction. Three days later the remaining distal tubing was again isolated, connected to a red rubber catheter and externalized to the upper end of the incision. Attempt was made once again to remove the catheter under direct vision, but this was unsuccessful despite a considerable amount of force being applied.

Postoperatively, the externalized tubing was gradually subjected to increasing tension by means of taping to ever more distal areas of the neck (Fig. 1). This was done under continuous electrocardiographic monitoring. On the fifth day the entire cardiac end of the shunt came free and was removed. The patient was continued on systemic antibiotics for 3 weeks and the shunt replaced without complication.

Discussion

It is generally accepted in both the neurosurgical and cardiovascular literature that it is rarely possible to cure a bloodstream infection with an infected foreign body in the heart.10,12 Thus removal of both the proximal and distal shunt tubing usually constitutes the first step in the treatment of a shunt infection. In this particular case we therefore felt that cardiotomy would be indicated if no other more benign method could be found to remove the distal shunt tubing from the heart.

Although there have been several recent papers on the cardiac complications of ventriculotriall shunts,6,11 to our knowledge there have been no reports of the entrapment of the distal catheter in the cardiac wall. Several reports have documented erosion of the distal catheter through the cardiac musculature,6,11 and it is quite possible that our case could have gone on to cardiac perforation if the distal catheter had not been removed from the heart wall.

Cardiac arrythmia as a complication of ventriculotriall shunt has been mentioned briefly.11 Such arrythmias are not infrequent, however, as a side effect of pace-
Removal of trapped distal shunt catheter

maker catheter manipulation. In our case the ventricular premature contractions occurring after each episode of tugging served to indicate that the catheter was embedded in the heart and not just caught in scar tissue more proximally. Too vigorous traction applied acutely to a pacemaker catheter has been reported to cause cardiac wall invagination and secondary hypotension. Consequently the recently reported venous catheterization technique for the retrieval of a disconnected distal shunt catheter would appear quite risky in a case such as ours, where the catheter was embedded within the cardiac parenchyma, rather than lying free within the heart.

Although the technique of graded skin traction has not been previously described in the neurosurgical literature, it has recently been used successfully in three patients in whom cardiac pacemakers could not be acutely removed. The prolonged skin traction is thought to result in sufficient ischemia of the constricting bands to cause their necrosis, with the consequent freeing of the catheter tip.

The technique of graded skin traction is a benign method for the removal of an entrapped distal shunt catheter. We believe it is the treatment of choice in those rare situations where the distal end of an infected shunt has become entrapped within the heart.

References


Address reprint requests to: Robert Morantz, M.D., Department of Neurosurgery, New York University Medical Center, 550 First Avenue, New York, New York 10016.

J. Neurosurg. / Volume 38 / April, 1973