Revised linear growth often causes cephalad migration of the atrial catheter of ventriculo-cardiac derivations in small infants and has frequently necessitated revision of the shunt. For this reason, the practice of placing the tip of the cardiac tubing at the point where the superior vena cava enter the right atrium has been gradually abandoned for a more distal placement of the catheter, well within the right atrial chamber. Occasionally, it is placed very close to the atrial orifice of the inferior vena cava or even within the vessel itself.1

When the atrial tubing has migrated into the superior vena cava, it frequently becomes occluded and progression of the hydrocephalus will ensue. In these cases, clinical examination will confirm nonfunction of the shunt and a chest film will show that the tubing has moved cephalad to its original atrial location. It then becomes necessary to substitute a longer catheter for the now relatively shorter cardiac limb.

Revision of the venous end of the shunt is usually quite easy. In several instances, however, technical problems have complicated, prolonged, or actually made the procedure impossible. Two types of complication have occurred most frequently:

1. The superior vena cava may be found to be completely thrombosed. This makes a ventriculo-cardiac derivation on either side impossible, unless a firm probing instrument is forced through the solid thrombus into the right atrium. In some cases, although no actual thrombosis has taken place, the tubing becomes so firmly adherent to the venous lumen that even forcible attempts at removal will not allow withdrawal of the catheter. This maneuver may also precipitate dangerous pulmonary embolization.

2. If the superior vena cava is still patent, insertion of a longer cardiac catheter may result in coiling of the tube upon itself or misdirection of the tube into one of the subclavian veins.

We thought that a rather simple maneuver would quite readily obviate these latter difficulties. As shown in Figs. 1, 2 and 3, a thin polyethylene, or preferably a No. 3 French nylon, olive-tipped ureteral catheter can be passed without difficulty into the short venous tube, past its tip, into a more favorable position. This is then checked with a chest film. The old, now short, venous tubing can then be slipped out over the ureteral catheter and a new, longer tube inserted over it, with little or no difficulty. Thus, using the ureteral catheter as a guide, the venous tubing can be accurately replaced in an optimal position.

We carry out the revision as follows:

1. Reopen the cervical incision.
2. Inject a few millimeters of Hypaque into the cardiac catheter while a chest film is being taken, preferably on a polaroid film.
FIG. 2. The tip of the catheter has migrated upwards and now lies within the superior vena cava. At this point, revision is performed. The ureteral catheter, or any thin polyethylene catheter, is passed through the cardiac tubing into a more desirable position, and checked with a polaroid film. The cardiac tube is now removed leaving the ureteral catheter in place.

FIG. 3. A new cardiac tube, longer than the one just removed, is then passed over the ureteral catheter into the right atrial chamber, without fear of misplacement. The position may be checked once more with a polaroid film, and the ureteral catheter can then be withdrawn.
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3. Insert a length of ureteral catheter 2 or 3 cm. longer than that of the original cardiac tubing.
4. Reinsert a cardiac tubing of the desired length.
5. Make a final check by x-ray.
6. If the superior vena cava is found to be obstructed (Fig. 4), either a ventriculo-peritoneal or ventriculo-pleural shunt is established (utilizing a Holter plastic button with or without omentectomy in the first instance).

In order to avoid thrombosis of the superior vena cava, we feel that early revision should be carried out. Frequent clinical examinations may reveal poor function at an early stage. Furthermore, the tip of the venous catheter should not be allowed to migrate above the T-4 level even if the shunt seems to be functioning properly.

Summary

We have described a simple operative procedure which allows for greater ease of revision of ventriculo-atrial shunts. The procedure utilizes a ureteral catheter over which new tubing may be introduced into the atrial chamber without fear of displacement.

References


Fig. 4. Thrombosis of the superior vena cava and the resulting collateral circulation. An attempt to reinsert a new venous limb had resulted in misdirection of the tubing into the left brachiocephalic trunk. Injection of Hypaque into the left internal jugular vein shows filling of the left brachiocephalic trunk, as well as an enormously dilated accessory hemiazygos vein, draining into the hemiazygos system, the inferior vena cava, and the right atrium. The azygos system is also filled. Note the large irregular filling defect due to the thrombosed superior vena cava, as well as the reflux of medium into the misplaced venous tubing.