MICROSURGERY IN CLINICAL UROLOGY

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ABSTRACT — Microsurgery is not a new tool to the urologist. Transurethral resection is probably the most challenging type of microsurgery, and we do it daily. The manipulations of microvascular dissections and anastomoses may be more intricate, but the basic concept of performing delicate procedures while looking down a tube is "old hat" to us. The new techniques discussed here may extend the range of operative solutions to difficult clinical problems in urology perhaps as transurethral resection did in the thirties and forties.

The use of the microscope in surgery has recently made possible anastomosis of blood vessels as small as 0.33 mm. in diameter.[1,2] These techniques originated in research laboratories performing organ transplants on rats, but clinical applications in the field of urology are vast and exciting.

Method

The basic method of microsurgical anastomosis is summarized in Figure 1. Interrupted 10-0 nylon sutures are best; the continuous suture technique of macrovascular surgery is too imprecise for vessels under 1 mm. in diameter. The first two anterior row sutures should be placed 120 degrees apart from each other, thus allowing the back wall to fall away. Once the anterior row is completed the vessel is turned over and the posterior row (240 degrees) is sutured anteriorly. When dealing with delicate veins whose walls tend to collapse together, the operative area should be flooded periodically with saline solution. This "underwater" technique helps keep the ends of the veins open for an easier anastomosis. The various stages of the anastomosis are demonstrated in Figure 2, A and B.

Figure 3 shows the instruments required. For anastomosing vessels under 1 mm. in diameter the microscope should be used at 24 to 36 power

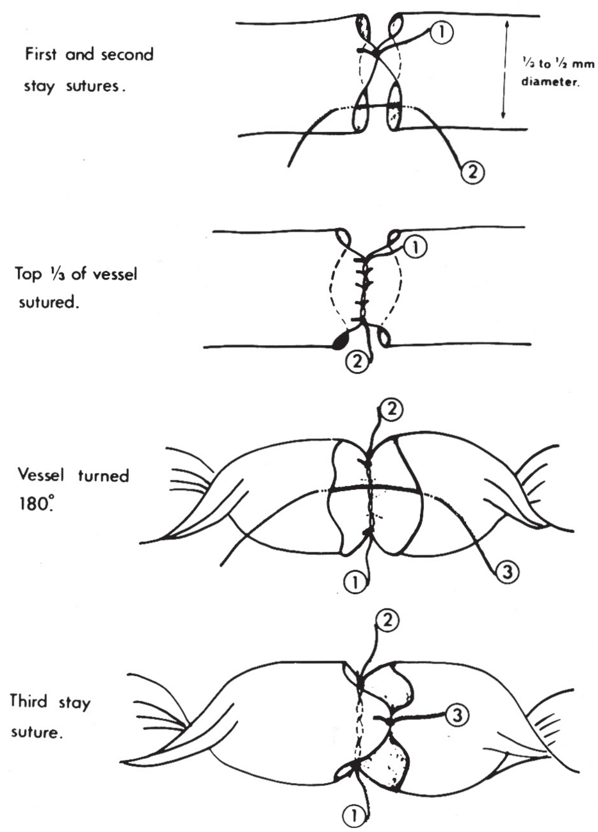

FIGURE 1. *Vessels under 1 mm. in diameter require interrupted sutures of 10-0 nylon. Initial anterior row stay sutures should be 120 degrees apart rather than 180 degrees to allow back wall to fall away.*

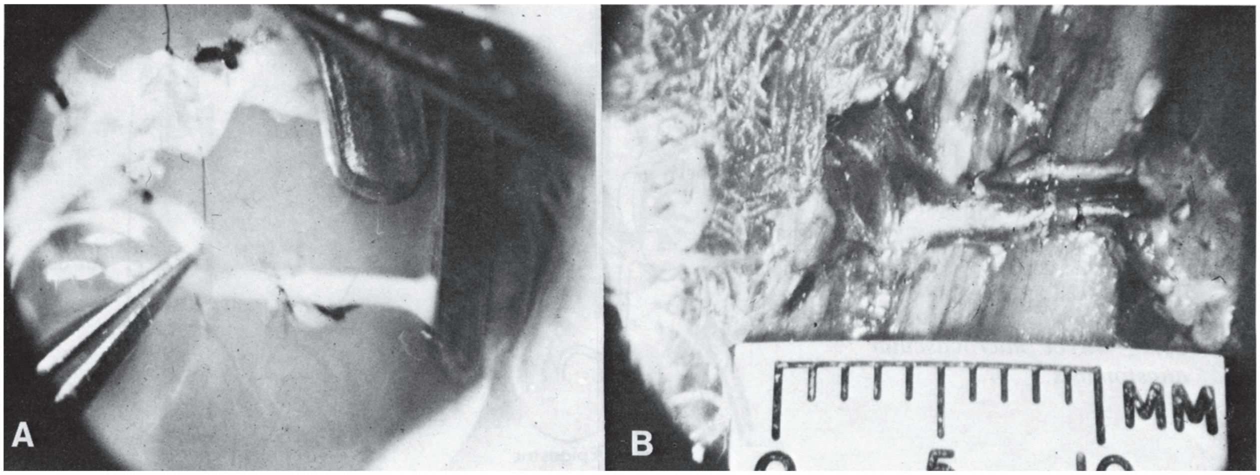

FIGURE 2. *(A) A 0.5 mm. artery has already been anastomosed and its accompanying vein, 1.3 mm., is being anastomosed. (B) Anastomoses completed and clamps removed.*

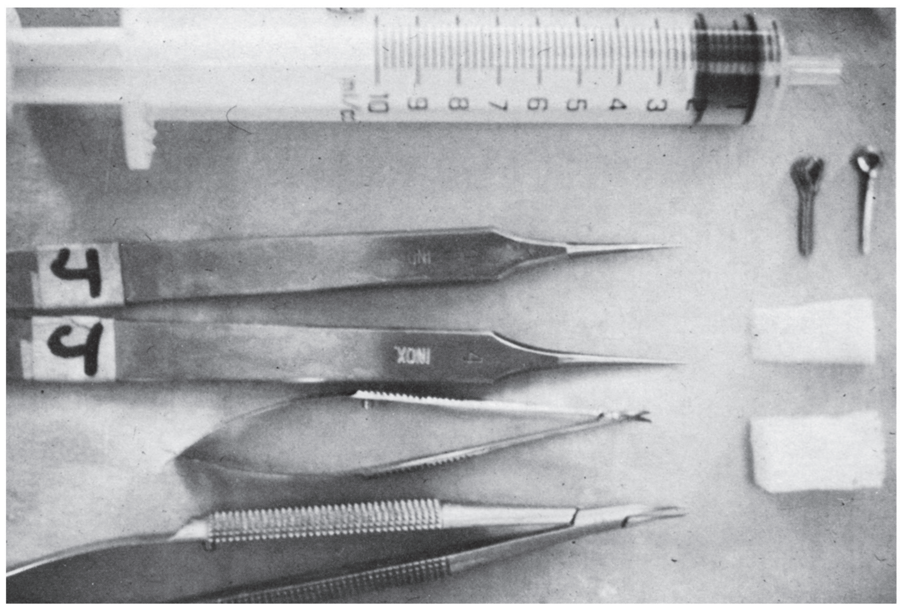

FIGURE 3. *Instruments required are Scoville-Lewis neurosurgical clamps, jewelers forceps, microscissors, and Barraquer needle holders.*

with maximum illumination. Prior dissection and clearing of the vessels can be done at 6 to 16 power. Number 3 jeweler's forceps are used for clearing larger vessels (above 1.5 mm. in diameter), but number 4 and 5 are necessary for finer vessels. The most convenient and least damaging vascular clamps are Scovill-Lewis neurosurgical clips.

Clinical Procedures

Orchidopexy

Approximately 5 per cent of cryptorchid testes are intra-abdominal and cannot be completely brought down into the scrotum by conventional methods. However, this can easily be accomplished by dividing the spermatic artery and vein near the aorta and vena cava, and reanastomosing these vessels to the saphenous vein and the (deep or superficial) inferior epigastric artery (Fig. 4). We have successfully performed the first such operation on a nine-year-old boy with prune belly syndrome at Royal Children's Hospital in Melbourne.

Some helpful technical points became apparent from this experience. First, the dissection of the spermatic vessels and their division proximally is made easier by an intraperitoneal approach. Second, the spermatic vein is generally a great deal larger in diameter than the inferior epigastrics.

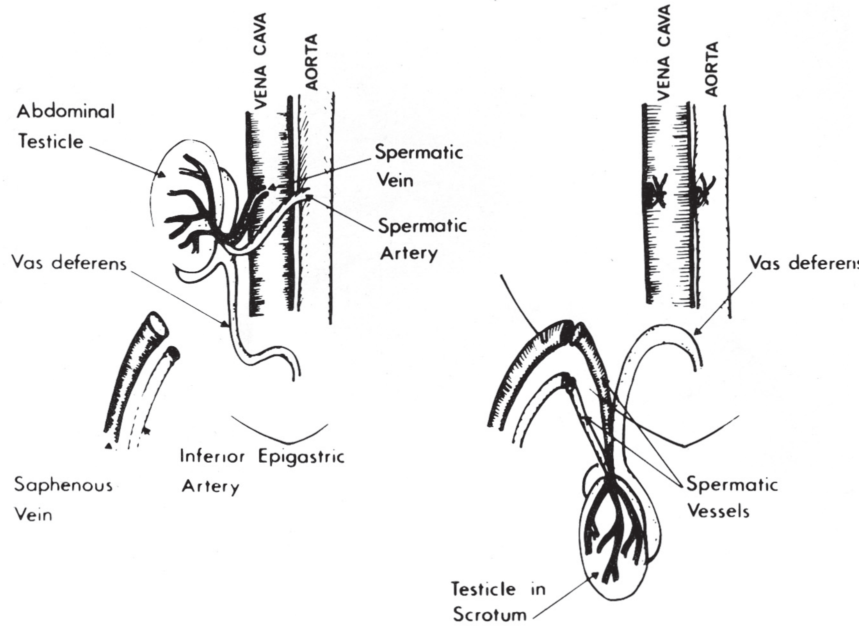

FIGURE 4. *Intra-abdominal testis can be autotransplanted to scrotum using direct microvascular anastomosis.*

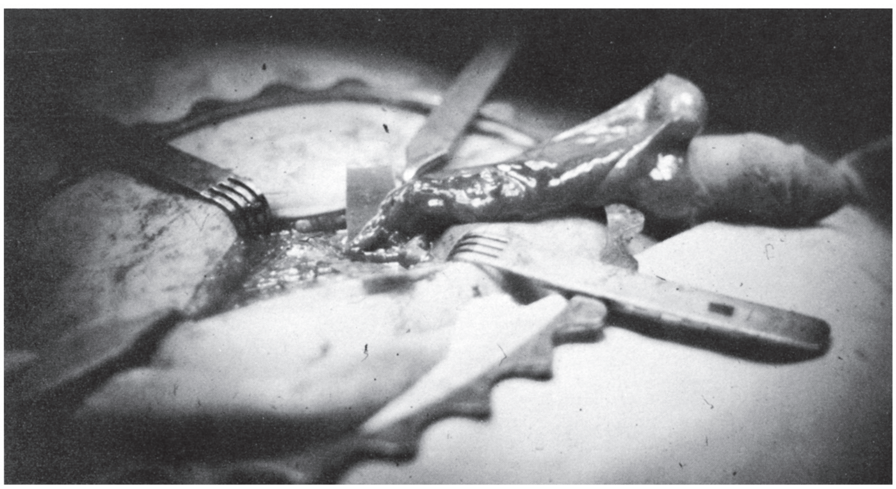

FIGURE 5. *With reanastomoses complete, testis can now be easily placed in scrotum.*

Thus, it is wiser to divide the saphenous vein 3 cm. distal from its origin and swing it cephalad into the groin area than to use a more conveniently located but smaller inferior epigastric vein. Inadequate venous outflow is the major threat to a successful testicular autotransplant. Finally, although the vas deferens should not be divided, the marginal collateral circulation through it is sufficient to cause a constant trickle of blood out of the divided spermatic vein. Under the microscope this trickle can look like a torrent and make the anastomosis technically difficult. It is therefore wise to place a microvascular clamp on the vas deferens as well as on the spermatic vessels before performing the anastomosis.

This procedure allows easy placement of the high testis into the scrotum with no tension (Fig. 5). Its long-term results will not be known for many years, but the operation is technically simple, ischemia times are under thirty minutes, and immediate results appear good.

Vasovasostomy

When viewed under the microscope our conventional techniques for vasovasostomy appear crude indeed. Generally, a 4-0 nylon suture or a very small polyethelene tube is used as a splint around which four interrupted sutures are placed through the thick muscularis of the vas for its reanastomosis. However, the lumen of the human vas deferens is only 0.5 mm. in diameter.[3] The nylon splint is often not accurately placed in this lumen, and certainly the stitches never are. Under the microscope it becomes clear that the mucosa is fragile and easily stripped.

In good hands this conventional approach will yield sperm in the ejaculate in as much as 75 per cent of cases, but pregnancy is uncommon, and the sperm count is generally low.[4] One author has reported as high as 50 per cent success in restoration of fertility (as determined by pregnancy of the spouse), but pregnancy correlated with a normal sperm count postoperatively and did not correlate with appearance of sperm antibodies.[5]

Some have blamed their poor results on sperm antibody production after vasectomy, yet experimental evidence indicates that sperm antibodies may not decrease fertility in vivo.[6,7] With microsurgical technique a perfectly accurate reanastomosis of the vas deferens can be achieved, and vasectomy becomes easily reversible. Certainly, the designers and manufacturers of valves and fancy devices for this purpose can do no better than our simple fifteen-minute microsurgical procedure. The basic technique is similar to that for a microvascular anastomosis, with the following exceptions: The thin mucosal layer is anastomosed with 10-0 nylon interrupted suturing as usual. The thick muscularis is then closed with 6-0 nylon interrupted suturing (Fig. 6). Fourteen such vasovasostomies have been per formed in Australia with a resultant 100 per cent incidence of pregnancy in the spouse. We are presently trying to repeat our work in the United States. Schmidt,[8] in California, has very recently abandoned splinting and is using an operating microscope. However, he uses only three 6-0 nylon sutures all the way through the thick muscularis and thin mucosa in one bite. This is simpler than our approach and may be quite adequate, but it runs a greater risk of partial obstruction and sperm granuloma.

Renal bench surgery

The concept of taking out a kidney, cold-perfusing it, operating on it outside the body, then autotransplanting it when repaired has recently captured the enthusiasm of renal vascular surgeons. In practice, many of these cases could have been managed with a more conventional approach, but certainly microscopic technique can be of great use in otherwise inoperable lesions.[9-11]

Although vessels of 1.5 mm. in diameter can be anastomosed with the help of simple optical loupes, the procedure is tedious and difficult. Certainly, vessels under 1 mm. in diameter cannot possibly be anastomosed without the microscope. Our hands can be trained to do the most incredibly minute surgical tasks if vision is adequate. Under 24 to 36 power magnification, a vessel 1.5 mm. in diameter should fill the operative field and be anastomosed in ten minutes without any strain on the operator's nerves. This method allows the repair of difficult aneurysms or tertiary branches of the renal artery. Very few cases really require such bench surgery, but, when they do, the use of a microscope and interrupted 10-0 suturing will make feasible otherwise impossible operations.

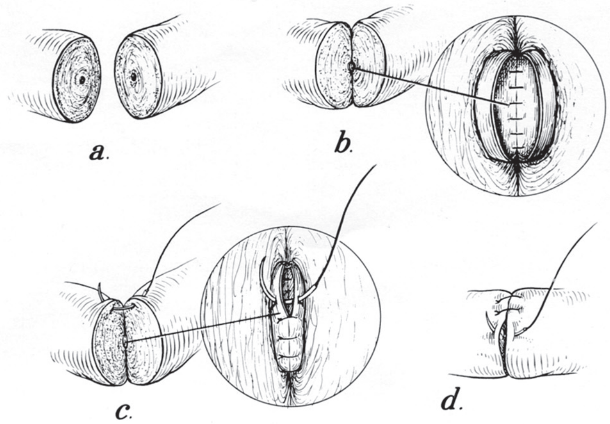

FIGURE 6. *Stepwise diagrammatic representation of experimental microsurgical approach to vasovasostomy. In human cases proximal lumen is larger than distal lumen.*

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