

## MICROSCOPIC VASOEPIDIDYMOSTOMY: SPECIFIC MICROANASTOMOSIS TO THE EPIDIDYMAL TUBULE\*

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*A new microscopic technique for vasoepididymostomy is described. Conventional approaches to epididymal obstruction rely on the formation of a fistulous tract after the walls of the vas deferens are grossly sutured to the outer tunic of the epididymis; such methods have a low success rate. With a direct and accurate end-to-end anastomosis of the inner lumen of the vas deferens specifically to the epididymal tubule there is a greater likelihood of normal patency. Furthermore, such an anastomosis can be performed at the lowest possible level of the epididymis, allowing a greater opportunity for sperm maturation. Fertil Steril 30:565, 1978*

Most cases of obstructive azoospermia are related to epididymal obstruction and are classically treated by vasoepididymostomy. Even severe oligospermia may sometimes be caused by partial epididymal obstructions which are also amenable to vasoepididymostomy.<sup>1,2</sup> However, the classic technique for vasoepididymostomy is somewhat gross and relies on the formation of a sperm fistula via a sperm granuloma that inevitably develops at the site of the attempted anastomosis. Various modifications of this gross technique have been utilized from 1936 until the present.<sup>3-6</sup> The classic procedure for vasoepididymostomy involves a longitudinal incision in the tunic of the epididymis, cutting through what appear to be multiple tubules of microscopic dimension, and checking for the presence of sperm in a slide preparation. If sperm are present, then a longitudinal slit is also made in the vas deferens and the walls of the longitudinally slit vas deferens are sutured side-to-side to the epididymal tunic. Even the most meticulous surgeons with the best results point out that the success of this procedure relies upon the formation of a sperm fistula, and scarring with partial

or complete obstruction is the major cause of failure.

The purpose of this paper is to describe the details of a microscopic technique for anastomosing the inner lumen of the vas deferens directly to the epididymal tubule, and to report preliminary results with this approach.

### OPERATIVE TECHNIQUE

After the scrotal sac is entered, the tunica vaginalis is opened and the testis and epididymis are everted from the hydrocele sac. The epididymis is carefully examined for signs of tubular dilatation, extravasations, and interstitial sperm granulomas. The dilated epididymal tubule in cases where obstruction is found is usually 0.1 to 0.2 mm in diameter. This dilatation is usually discernible with simple inspection, but observation under the operating microscope using  $\times 10$  to  $\times 16$  magnification makes it quite clear whether one is dealing with obstruction (Fig. 1). The epididymal tubule is a single, intricately coiled, 20-foot long duct enclosed within the outer tunic or capsule of the epididymis (Fig. 2). If one were to make a deep, longitudinal incision into this tunic, he would see the appearance of as many as 20 or 30 cut microscopic tubules. Without the benefit of microscopic observation it would appear that sperm were welling up from all of these tubules, whereas the sperm actually are coming from only

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FIG. 1. A dilated epididymal tubule indicates obstruction.

one of those many cut tubules. All of the other tubules have been disconnected from their continuity with the testes by the longitudinal incision. Only one of the uppermost tubules can actually be seen to drain sperm fluid continually from the testes.

Therefore, the ideal approach for re-establishing continuity of the ductal system would be to anastomose directly (end-to-end) the inner lumen of the vas deferens specifically to this one epididymal tubule. Although the obstructed epididymal tubule is indeed rather small (0.1 to 0.2 mm), it will approximate nicely to the lumen size of the vas deferens if sutured accurately. The difficulty and intricacy of the operation lies in the delicate, thin wall of the epididymal tubule. Furthermore, unlike the situation during vasovasotomy, when the first stitches can be placed anteriorly and then the vasovasostomy clamp simply flipped over 180°, the epididymis is not as mobile as the vas, and the epididymal ducts will not tolerate such handling. Therefore, in performing this anastomosis the first suture must be placed in the posterior position and subsequent sutures worked around anteriorly from that one.

There has been much debate about where to place the initial longitudinal incision in the epididymis when a conventional vasoepididymostomy is performed. Some surgeons recommend starting out as low as possible: the longer the length of epididymis that is still intact for the sperm to pass through before passage into the vas deferens, the greater the chance for normal maturation. Others recommend making the incision higher, near the caput, to be more certain of bypassing all obstruction. A direct transverse transection of the epididymis has not been recommended in the past, and yet this is obviously the most logical approach. This way one can slice off portions of the epididymis higher and higher until sperm are recovered at the lowest possible level still above the area of obstruction. More important, the epididymal "tubules" can be observed more easily on the surface of the cut, and the one that is leaking sperm can more readily be identified (Fig. 3).

First the lower epididymis is dissected from the surface of the testes using careful microdissection and bipolar microcautery. Once 1 cm or more of epididymis has been dissected free of the testicu-





FIG. 2. Retrograde vasogram demonstrates that the epididymis is one continuous, intricately convoluted, 20-foot long tubule.

lar surface, a Penrose drain or Silastic tubing can be placed around it and attention is then turned to the vas deferens. The vas deferens is freed as one would normally do for a vasovasostomy and dissected down to near the convoluted portion. One should feel free to mobilize the vas deferens sufficiently so that it can easily reach the epididymis without tension. Occasionally this may require an extensive incision up to the level of the external inguinal ring. We are not fearful of compromising the blood supply to the vas deferens; bleeding from the cut edge of the distal vas deferens verifies that extensive mobilization can be performed without risk of devascularization. It would be a greater risk not to mobilize the vas deferens sufficiently so that tension existed on the suture line. The dissection of the vas and the epididymis thus described can be performed readily under  $\times 2.5$  simple ocular loupe magnification.

Once the cut end of the vas deferens has been prepared and vasography performed to ensure patency of the ejaculatory duct, the operating microscope is brought into the field under  $\times 16$  magnification and sometimes  $\times 25$  magnification. The epididymis is then transected completely at the lowest point at which it has been dissected free of the testis. This point will usually still be somewhat below the area of obstruction. Bleeders observed on the cut surface of the epididymis under

the microscope are cauterized with the microbipolar forceps. The assistant irrigates the area and the cut tubules are examined. Under the operating microscope three to ten cut tubules are usually visible in the transected surface of the epididymis, and all are carefully examined for the efflux of any sperm fluid. If one is still below the area of obstruction there will be very little, if any, oozing of sperm fluid. In case of any doubt, a slide can be smeared along the cut surface and observed under a standard laboratory microscope for the presence of sperm. If no sperm fluid effluxes from any of the tubules, another transection is made 0.5 cm proximal to the last one. The resulting tissue specimen is saved for histologic examination. Eventually one reaches an area where there is a rampant gush of sperm fluid, and again a slide preparation is made. If sperm are detected, whether alive or dead, we elect to perform the anastomosis at this level. In this way, a maximal length of epididymis can be salvaged.

Although with gross observation it appears that sperm fluid is oozing from the entire cut surface of the epididymis, a close observation under the microscope with the help of an assistant using a microirrigation syringe and a microswab reveals immediately that the sperm fluid is coming only from one of those many transected tubules. The other tubules are clearly discon-

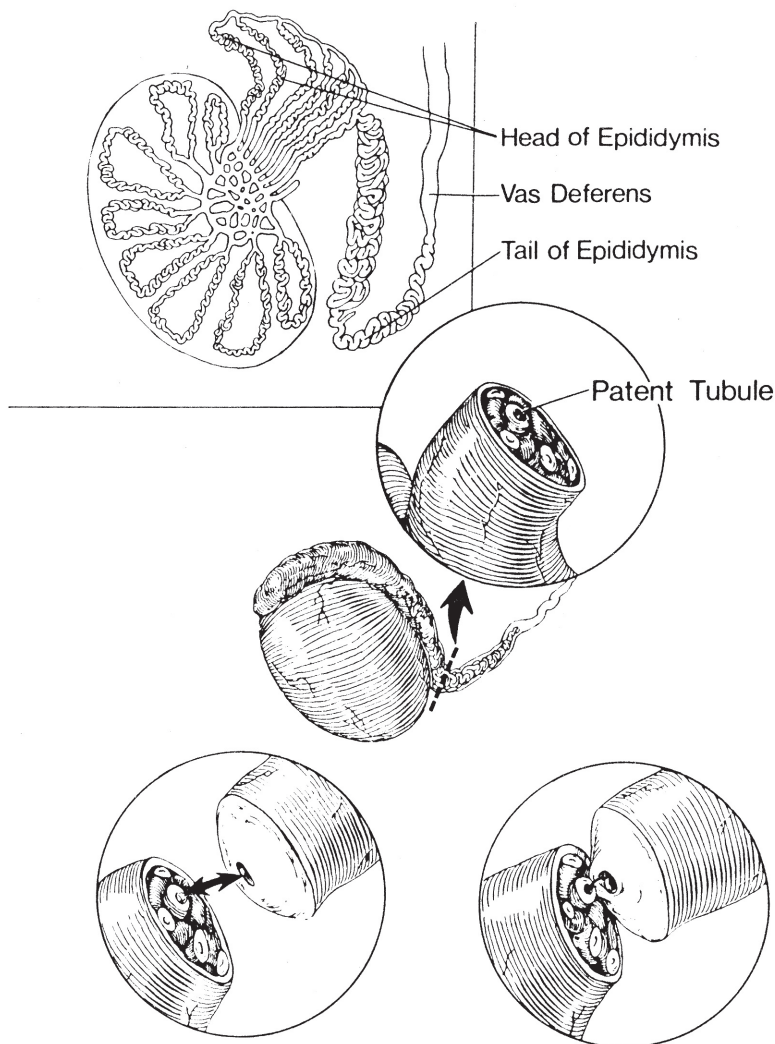


FIG. 3. Diagrammatic representation of exposure of epididymal tubule for anastomosis. All but one of the cut tubule edges are disconnected from the intact proximal epididymis.

ected from the proximal portion of the epididymis. This one specific tubule which is effluxing sperm is the one to which the vas lumen is anastomosed. The fluid effluxing from the epididymal tubule is usually translucent but may have a yellowish, creamy appearance or may even be transparent. If there are no sperm in this fluid we then elect to transect higher until we reach a level where spermatozoa are detected.

The anastomosis is then performed using interrupted sutures of 9-0 or 10-0 nylon (Fig. 4). The first two sutures are placed posteriorly from outside to inside the epididymal tubule (Fig. 5). Without these initial marker sutures, subsequent visualization of the tubule which is effluxing sperm would be rather difficult. The vas deferens is then brought into the field of the operating microscope and each of the sutures in turn is then

placed from inside to outside in the mucosa of the posterior surface of the vas deferens. Each of these two initial posterior sutures is then tied down with jewelers forceps and the microneedle holder. The ends of the tied sutures are then cut and the mucosal apposition is evaluated. One

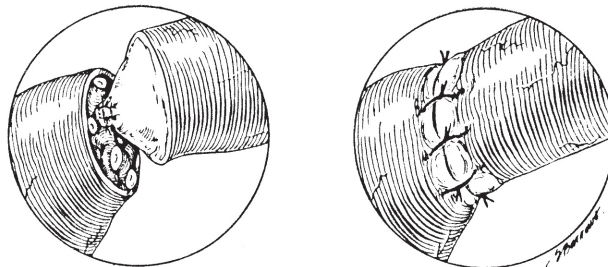


FIG. 4. Diagrammatic representation of specific anastomosis to the epididymal tubule, end-to-end.





FIG. 5. First suture in tubule.

should be able to see good approximation of the mucosa of the vas deferens directly to the epididymal tubule; the diameters of the two lumina should match well. Jeweler's forceps are then inserted in the lumen of the vas deferens to help to expose it, two anterior mucosal sutures

are placed from outside to inside, and then these sutures are placed in the epididymal tubule from inside to outside and tied (Fig. 6). Once the epididymal tubule has been anastomosed to the lumen of the vas deferens, the most difficult part of this procedure is completed and the outer muscularis of the vas deferens is then separately sutured to the epididymal tunic using ten to twelve 9-0 nylon interrupted sutures. The inner mucosal anastomosis is extremely delicate and thus the outer muscularis anastomosis is required for stability and support. The scrotal contents are then placed. No splints are used. The patient wears an athletic supporter for 1 month postoperatively and is encouraged to rest as much as possible during the 1st week. He is usually discharged from the hospital 1 day (occasionally 2 days) postoperatively.

#### FOLLOW-UP AND RESULTS

Monthly sperm counts are obtained on each patient subjected to vasoepididymostomy. Fourteen patients have now been followed for 3 to 8 months. Results are therefore only preliminary. Twelve of these fourteen patients presently have

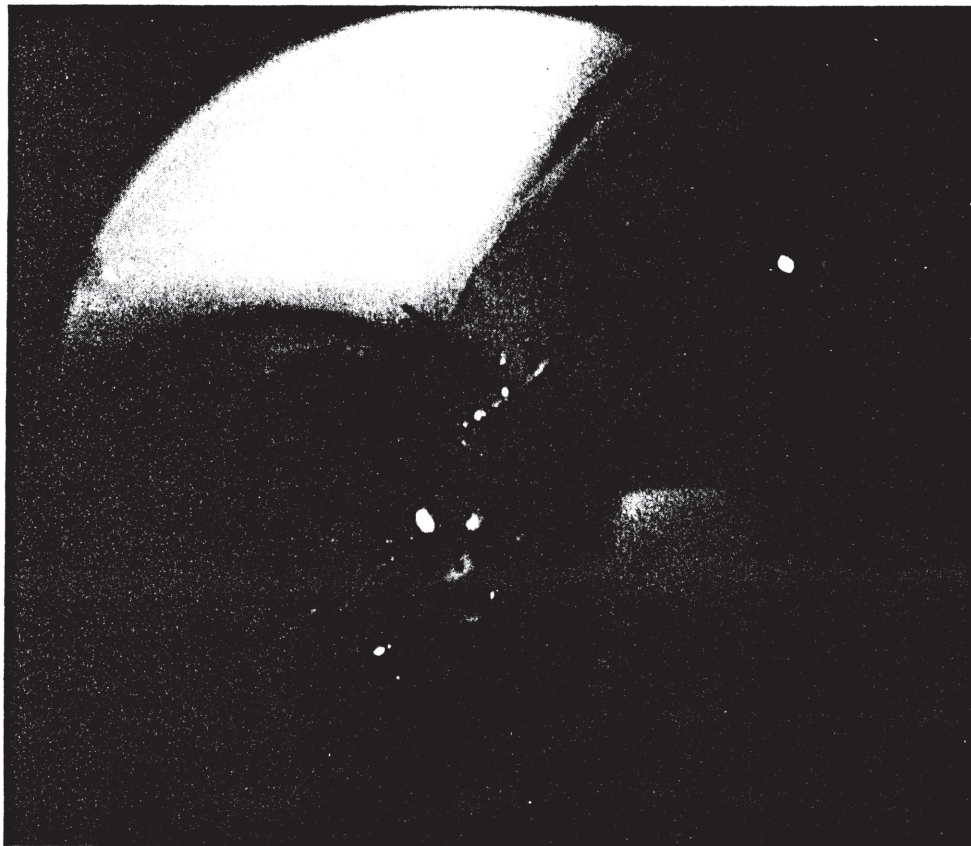


FIG. 6. After initial two posterior mucosal sutures have been tied, the anterior two mucosal sutures are placed.

numerical sperm counts of greater than 20 million/ml and greater than 50 million sperm/ejaculate. Two of the fourteen patients are azoospermic at 5 months and 6 months postoperatively. These were also the only two patients whose epididymal fluid revealed only a few rare sperm heads at the level of the anastomosis. The other 12 patients (all of whom had a normal numerical count postoperatively) had morphologically intact sperm in large numbers at the level of the anastomosis. It appears that in the two failures, because of our zeal to perform the anastomosis as low as possible, we did not get above all of the areas of obstruction. Of the 12 patients with normal numerical sperm counts only 1 has poor motility. The anastomoses on each side in this patient were performed at the level of the head of the epididymis. His sperm count 8 months postoperatively was 44.8 million/ml with a motility of 2%. The vasoepididymostomies of all of the other patients were performed in the corpus epididymidis and all had normal motility.

Thus 86% of the patients had good numerical counts and 79% had completely normal semen analyses. All of the patients with normal numerical counts were anastomosed at a level where many intact sperm were seen in the epididymal fluid. The only two men in whom there was azoospermia postoperatively were patients in whom it was doubtful that all levels of obstruction had been bypassed. The one patient undergoing anastomosis of the vas lumen to the epididymal tubule in the region of the caput had a good numerical count but very poor motility.

Many patients who eventually developed normal sperm counts had very low counts 1 or 2 months postoperatively. Counts then tended to improve gradually in most patients in a pattern similar to that observed after vasovasostomy.

#### DISCUSSION

Gross techniques of vasoepididymostomy in the best hands usually have resulted in a "patency" rate of about 50% and rates of 10% to 20% normal semen analysis.<sup>4, 7, 8</sup> Any pregnancies reported after such procedures usually were achieved by patients who developed good semen parameters rather than merely a few transient sperm indicating "patency." In most successful cases, pregnancy did not occur until 6 months to 2 years after surgery. Therefore it is too early to evaluate pregnancy rates in this preliminary report.

However, a number of tentative conclusions can be reached which will guide our future efforts.

First, it is possible to obtain a reliable and specific anastomosis of the vas deferens lumen directly to the epididymal tubule. Such a surgical approach may allow us to evaluate the functional fertilizing capacity of sperm derived from various levels of the epididymis. By minimizing the confusion that is created by partial patency and its secondary effects on motility and sperm transfer, we can more easily interpret the results of semen analyses and pregnancy rates in relation to the level of the epididymal occlusion.

Second, it does appear that it is important to perform the anastomosis as low as possible in order to obtain the greatest percentage of motile, fertilizable sperm. On the other hand, if the surgeon reaches a level of transection where sperm fluid is obtained but the content is meager with only a few sperm parts seen, an agonizing decision has to be made. If he transects up to a higher level he may be sacrificing valuable epididymal length. On the other hand, if there are multiple levels of obstruction and the surgeon has not bypassed all of those obstructions, then even the most beautiful anastomosis will not result in patency. Therefore, the surgeon should continue upward until he reaches a level of the epididymis in which the fluid harbors a great many intact sperm. If this principle is adhered to, and if an accurate and specific microscopic anastomosis is performed, most patients should achieve a normal sperm count. Those in whom such an anastomosis is possible at the level of the corpus should also have good motility.

The over-all patency rate in this early series is 86%. The incidence of normal semen analyses is 79%. The follow-up is too brief to evaluate pregnancy rates. As greater experience and follow-up continue there are bound to be many failures. But at least this technique allows us to achieve more reliable and interpretable results in cases of epididymal obstruction.

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