Vasectomy by Electrocautery: Outcomes in a Series of 2,500 Patients

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The effectiveness of the electrocautery technique of vasectomy is compared with the more commonly used ligation technique. Twenty-five hundred cases of vasectomy by electrocautery are presented. The men were Americans who selected vasectomy over a period of 11 years. All cases were performed by one unvarying technique. The vas was cut, and the lumen was cauterized. One end was covered, and all bleeding sites were cauterized. The failure rate in this series was 0.24 percent. A review of the world literature shows that failure rates of the common ligation techniques ranged from 1 to 6 percent. It appears that the electrocautery technique has about one tenth the failures of the standard ligation technique.

Vasectomy and tubectomy (the international term for tubal ligation) share the distinction in approximately equal numbers of being the most popular ways to prevent unwanted pregnancy in America in couples aged over 30 years.[1] Vasectomy is a procedure that most American men might find themselves considering at some time in their lives. For the short time it takes, the benefits are far reaching. As a result of this brief operation the future size of an entire family is fixed, and life can be lived without fear of unwanted pregnancies.

Each physician whose technique the author has observed (more than 15) has a different procedure. If any one technique is significantly better than others, it would seem prudent to recommend it as the method of choice. Until recently, it had not been clear that there is a best method of performing vasectomy. This paper presents evidence that the electrocautery method has superior outcomes.

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Methods

Operative Technique

The electrocautery technique has been developed and popularized by Dr. Stanwood Schmidt.[2] After informed consent is obtained, a preliminary examination of the testes, searching for hard nodules (testicular cancer), is carried out.

The vas is isolated high in the relaxed scrotum just under the skin. Local anesthesia is given through a 27-gauge needle using 1 percent lidocaine. An incision is made, and the vas is brought out. The sheath is removed by cutting down to the vas, and the vas is cut once. A thin cautery needle is introduced into both lumens, and a current sufficient to cauterize skin bleeders is turned on. (A Ritter Coagulator was used in all cases.) No more than 5 mm of vas is cauterized in a graded manner. By steadily removing the cautery needle as soon as the current is turned on, a gradually increasing cauterization is achieved so that scar closure can occur somewhere along the gradation. The distal end is covered with its surrounding sheath, using 0000 chromic catgut to secure it. Hemostasis is

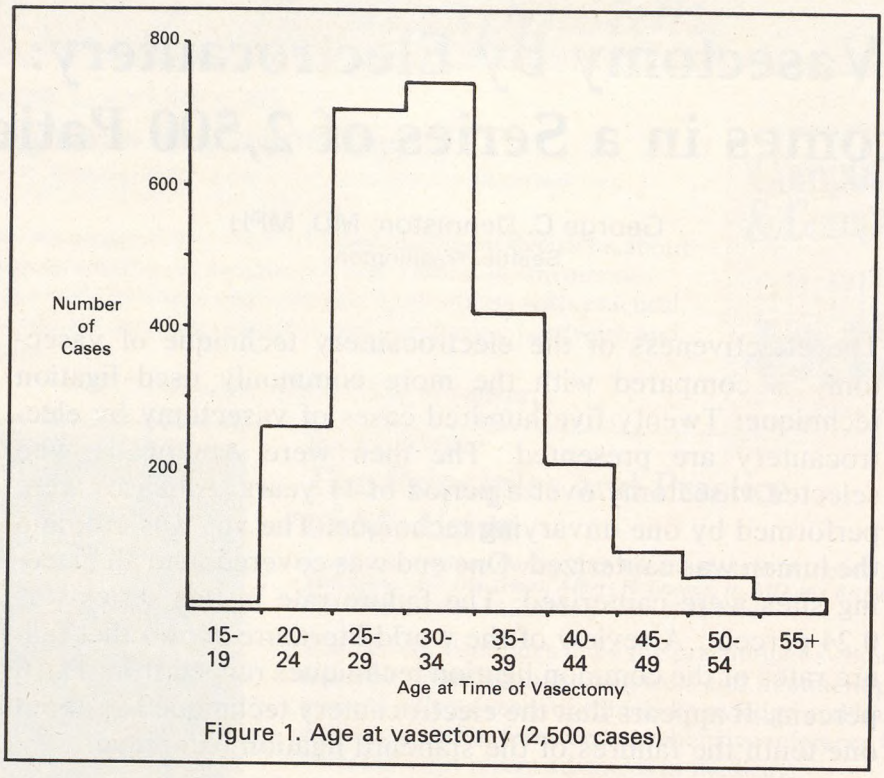

Figure 1. Age at vasectomy (2,500 cases)

assured with the same cautery setting. The vas is dropped back through the incision, which is also closed with 0000 chromic catgut so the patient need not return for suture removal.

To permit closure by scarring of the cauterized ends and to prevent a failure, the patient is instructed to abstain from ejaculation for one week. Careful contraception must be maintained until the results of a semen analysis are negative. After 15 ejaculations and a minimum of six weeks, the patient is scheduled to have his semen checked.

It is prudent for the surgeon to suspect varicocele in every case. In this manner he will be more likely to avoid cutting a vein. Isolation of the vas directly under the scrotal skin before incising reduces this risk. If a hydrocele is entered inadvertently, all the fluid from it should be expressed carefully to reduce the risk of infection.

The presence of two vasa on one side is extremely rare. If proven, a case report is warranted. (There is no evidence that any of the failures in this study had an extra vas.) Unilateral absence of the vas is more common, as is a partially undescended testicle. If the vas cannot be found or isolated easily under the scrotal skin, a decision not to operate should be considered.

Study Population

Between 1971 and 1982 a total of 2,500 men in this study were operated on by the author (2,363) and by Dr. David McLanahan (137). The same technique was used in all cases.

The age distribution of the study population is displayed in Figure 1. Fully 80 percent of the patients were aged between 25 and 45 years. Unlike other studies, 39 percent of all patients were aged less than 30 years. The author's policy has been to permit all men regardless of their age or number of children to have the surgery if they are fully informed and are clear that they want a vasectomy. Most of the men (68 percent) had one to three children (Figure 2). One fifth of the entire study group (21 percent) had no children. This percentage is again a reflection of the author's policy, and the results have been reported elsewhere.[3] As expected, most of the men were married (76 percent). Twelve percent were single, and 11 percent were divorced. The remaining 1 percent were separated, widowed, or of status unknown.

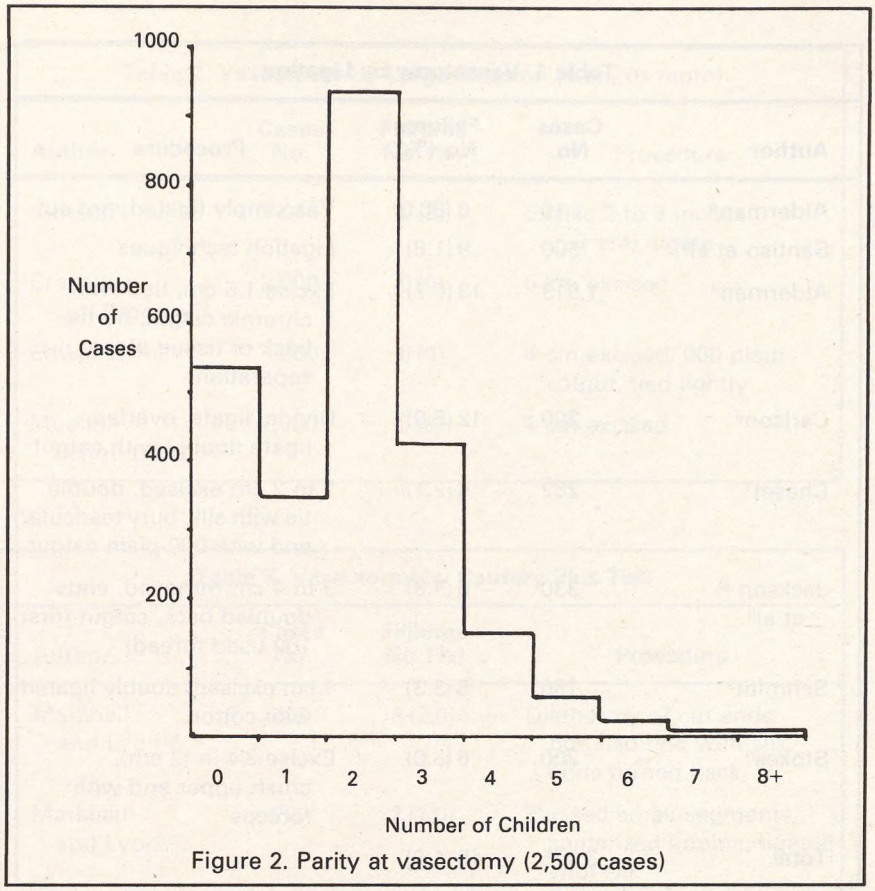

Figure 2. Parity at vasectomy (2,500 cases)

Results

Complications

Small hematomas occurred in 3 percent of patients. Two patients required hospitalization. Infection occurred in 2 percent of the cases. Most of these infections were simple stitch infections, and no patient with an infection required hospitalization. Sperm granuloma occurred in 1 percent of the cases. One patient had a second operation to remove a small sac into which sperm were continuously leaking. Congestive epididymitis, producing persistent discomfort in the epididymis, was diagnosed in 14 cases (0.6 percent). Neuroma was diagnosed in five cases (0.2 percent).

Failures

There was one pregnancy in the entire series. The man did not return for a sperm check until seven months later (after his wife had become pregnant). On semen analysis one live sperm was noted. A second pregnancy occurred, but it was determined that the woman became pregnant shortly after the patient's vasectomy (13 days and four ejaculations), and the pregnancy was clearly due to the patient abandoning contraception too quickly.

Five patients had technical failures, with no pregnancies resulting. These five patients had five to 50 persistent live sperm per high power field following vasectomy, and the procedure was repeated. All of these men had waited at least seven days following the first vasectomy before having intercourse, thus permitting the scar to form properly. These technical failures were genuine and could not be explained.

Three additional patients had persistent sperm in their semen analyses, but they had not abstained from ejaculation for seven days following the surgery. These cases need not be considered technical failures, since one week is required

Table 1. Vasectomy by Ligation

Author	Cases No.	Failures No. (%)	Procedure
Alderman[4]	10	6 (60.0)	Vas simply ligated, not cut
Santiso et al[5]	500	9 (1.8)	Ligation techniques
Alderman[4]	1,913	13 (0.7)	Excise 1.5 cm, tied with chromic catgut, no tie-back or tissue plane separation
Carlson[6]	200	12 (6.0)	Divide, ligate, overlap, ligate doubly with catgut
Chaset[7]	282	6 (2.1)	1 to 2 cm excised, double tie with silk, bury testicular end with 000 plain catgut
Jackson P et al[8]	330	6 (1.8)	3 to 4 cm removed, ends doubled back, catgut (first 100 used thread)
Schmidt[2]	150	5 (3.3)	1 cm excised, doubly ligated with cotton
Stokes[9]	200	6 (3.0)	Excise 3/4 in (2 cm), crush upper end with forceps
Total	3,075	48 (1.6)	

for scarring, and all patients are so informed. After a two- to three-month wait and two to three repeat positive semen analyses, all eight of these men had successful repeat vasectomies.

Thus six patients had a failure of the cautery technique, giving a failure rate of 0.24 percent.

Survey for Procedure Failures

To determine whether patients with failures did not return to the author (even though there was no additional charge for a repeat procedure) 109 members of the Washington State Urological Society were queried by mail as to whether they knew of any failures of vasectomies performed by the author or at the Population Dynamics center. These physicians had simply to check yes or no and return the letter in an enclosed self-addressed, stamped envelope. The physicians were informed that if the author did not hear from them by a given date, it would be assumed that they had not known of any failures. Fifty-seven percent replied with no such failure reported.

Discussion

A review of most published European, Australian, and American papers that include both the technique and the failure rate of vasectomy provides much useful information. Alderman[4] confirmed that simple ligation does not work (Table 1). In a statistically sound study from Guatemala, Santiso et al[5] indicated a failure rate for ligation approaching 2 percent.

Analysis of six studies[2,4,6-9] disclosed that using the ligation method—cut and tie—results in a failure (to close the vas) rate of 1.6 percent (Table 1). In an unusually large series, Alderman[4] achieved a somewhat lower failure rate (0.7 percent). Contrast this failure rate with those of the remainder of the studies in the ligation series in which the physi-

Table 2. Vasectomy by Large Excision (4 cm or more)

Author	Cases No.	Failures No. (%)	Procedure
Carlson[6]	1,041	0 (0)	Excise 2 to 3 inches (5-7 cm), ligate
Craft and Diggory[10]	2,000	0 (0)	5 cm excised
Edwards[11]	600	0 (0)	4 cm excised, 000 plain catgut, tied lightly
Mueller-Schmid et al[12]	1,000	0 (0)	4 cm excised

Table 3. Vasectomy by Cautery Plus Ties

Author	Cases No.	Failures No. (%)	Procedure
Marshall and Lyon[13]	400	8 (2.0)	Diathermy of cut ends, but also tied with silk, ends turned back
Marshall and Lyon[13]	200	2 (1.0)	Excised small segments, cauterized lumina, ligated with silk

cians did not have the large numbers of cases on which to improve their technique. The failure rates of the ligation method in these small series vary between 2 percent and 3 percent. Overall, the failure rate using ligation varies between 1 percent and 6 percent.

Another technique, excision of a relatively large piece of vas (4 cm or more),[6,10-12] has excellent results—no failures (Table 2). This technique does have two major drawbacks: there is considerable tissue damage because of the large piece of vas removed, with the consequent possibility of increased pain and complications; and (2) there is little chance for reversibility.[11] For these reasons, Edwards, after his series of 600, switched to the electrocautery technique.[11] As those who will wish reversal cannot be identified in advance, excision is not the technique of choice.

Table 3 tells another story. Cautery may be used near the ends, but if a ligature cuts through above the cauterized tip, the vas will leak, and failure may still occur. The failure rates with cautery plus ligatures are the same as with ligatures alone.[13]

The technique of clipping the vas is more effective if two clips are used on each cut end rather than only one clip (Table 4).[14] Special skill is required, however, to close one of these clips just enough to occlude the lumen every time without cutting through. Shortly after Moss[14] reported these results, he too switched to a variation of the cautery technique and is still using that method (Moss WM, MD, personal communication, 1983).

The electrocautery technique causes a natural closure using the body's ability to make scar tissue. The surgeon performs a graduated cauterization, and the fibroblasts grow completely across at the most favorable level. As in all techniques, skill is required to keep trauma and complications to a minimum, but physicians with small series will find that electrocautery does not require so much precision as a precise pull on the ligatures or a

Table 4. Vasectomy by Tantalum Clip

Author	Cases No.	Failures No. (%)	Procedure
Moss[14]	169	2 (1.2)	1 clip each end, excise, same plane
Moss[14]	400	0 (0)	2 clips each end

Table 5. Vasectomy by Electrocautery

Author	Cases No.	Failures No. (%)	Procedure
Schmidt[2]	1,000	0 (0)	Cauterization plus fascial sheath cover
Klapproth and Young[15]	200	0 (0)	"Small segment" excised; cautery; interposed tissue
Denniston (current series)	2,500	6 (0.24)	No vas removed; both ends cauterized; upper (distal) end covered.

precise pressure of the metal clip.

Careful cautery of skin bleeders prevents widespread ecchymosis, which may be frightening to the patient. Cautery permits better control of bleeders, which prevents hematoma as well as infection.

Klapproth and Young,[15] and Schmidt[2] claim excellent results with electrocautery (Table 5). The 2,500 cases reported here are believed to be the largest published series using the Schmidt technique. The failure rate in this series (0.24 percent) is about one tenth the failure rate for the standard ligation technique of vasectomy (2 percent).

As no piece of vas is removed and only small lengths are damaged by cautery, this technique also lends itself to successful surgical reanastomosis. The low incidence of complications and failures in this series provides solid evidence of the advantages of the electrocautery technique over other operative techniques and suggests that electrocautery should be the technique of choice for vasectomy.

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