



Arterial Epigastricocavernous Anastomosis for the Treatment of Sexual Impotence

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Previous histologic and phalloarteriographic studies that we have performed suggest that stenoses and occlusions of the arteries supplying the penis play a very important role in the etiology of sexual impotence in many patients. This report describes the results of direct arterial anastomosis to the cavernous bodies of the penis, using the inferior epigastric artery and microsurgical technique, in 21 impotent males ranging in age from 40 to 63 years. The objective of the operation was to increase basal penile blood flow to a level, determined by preoperative studies, just below that necessary to maintain an effective erection. A limited capacity to increase blood flow in response to an erotic stimulus could then suffice to produce an erection. The anastomosis became occluded in 6 patients, and the complication of priapism developed in 3. The bypass remained patent in 13 patients, 11 of whom experienced improved erection. Nine patients resumed normal sexual activity that, prior to operation, was impossible.

In 1973 we reported the first case of a direct arterial anastomosis to the cavernous body of the penis for the treatment of sexual impotence [1-3]. This report describes our results in 21 adult males who were subjected to an epigastricocavernous arterial anastomosis for sexual impotence.

Methods

Patient Material

Between May, 1973 and May, 1976, an epigastricocavernous anastomosis was performed in 21 male patients who had failed to respond to conservative treatment of sexual impotence for at least 1 year previously. Their ages ranged from 40 to 63 years, with a

mean of 50 years. The duration of impotence ranged from 1 to 12 years, with a mean of 4.7 years. There was no history of trauma or associated diseases in 14 patients. The remaining 7 patients had organic diseases that could have caused the impotence. These included diabetes mellitus of more than 7 years duration in 3, pelvic fracture with rupture of the urethra and rectum in 1, total prostatectomy for carcinoma 3 years previously in 1, a previous aortoiliac bypass operation in 1 (although impotence existed prior to operation), and excision of a pheochromocytoma 3 years previously in 1 patient.

There were 3 criteria for direct arterial surgery:

1. Impotence was well established to the point that no coitus was possible for more than 1 year. We have been unwilling to consider for operation men who reported only a decreased capacity for penile erection.

2. Pelvic arteriography excluded pathology in the pelvic vascular bed. In 4 patients pelvic arteriography showed sclerotic changes and in 2 of these there were occlusions of the internal pudendal or penile arteries or their branches.

3. The finding on electrocapacitance phalloplethysmography, carried out with the collaboration of Dr. Š. Figar, of spontaneous activity and reactivity changes in response to erotic visual stimulation. This study was performed in 18 of the 21 patients, and all but 2 had a positive response. The 2 exceptions were one patient with impotence following an aortoiliac bypass who showed no filling of the pelvic floor vessels and no vasodilatory or vasoconstrictor reactions in the penis, and one of the diabetics with penile involution.

Surgical Technique

Operation was performed under general anesthesia. Through a pararectal incision extended to the

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lower margin of the symphysis pubis preperitoneally, the inferior epigastric artery was isolated from its origin to the level of the umbilicus, where it was ligated and divided. The isolated segment was then shifted behind and below the inguinal ligament (Figs. 1, 2). After systemic heparinization, the body of the penis was occluded by 2 tourniquets applied subfascially above and below the site of the intended cavernostomy. The cavernostomy was performed under a dissecting microscope and penetrated into larger lacunae about 3 mm under the tunica albuginea. By connecting several lacunae a space was created to which the epigastric artery was connected by an end-to-side anastomosis using a continuous suture. The suture was placed so that there was direct contact between the intimas of the lacunae and of the epigastric artery. The suture passed on the side of the cavernous body through the superficial lacunae and the tunica albuginea. In the last 18 patients arterial flow was measured with a flowmeter after unclamping the ar-

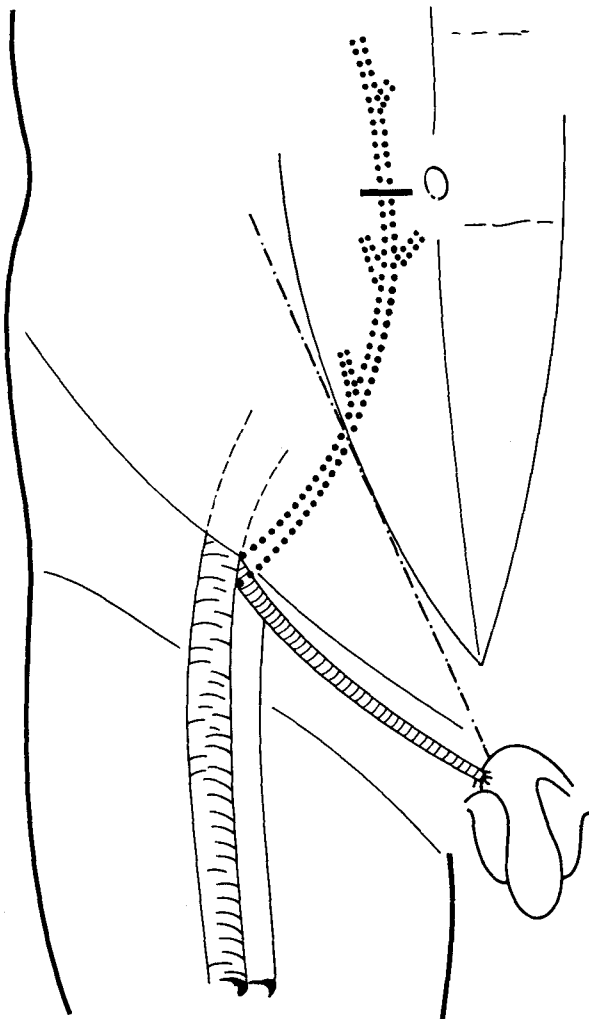


Fig. 1. Schematic drawing of the relocation of the inferior epigastric artery below the inguinal ligament for anastomosis to the penis.

tery and removing the tourniquets. In 7 of these, the flow rate necessary for erection had been determined by preoperative investigation [4] or during surgery.

Results

Blood flow rates measured in the shunt during operation in 18 patients ranged from 20 ml/min to 120 ml/min. The penis erected in 14 patients as soon as the clamps on the shunt were removed, and in 13 of these the erection subsided within 10 minutes. In 6 patients erection did not occur during operation, but there was an increase in penile volume, and in 1 patient, our first, there was only thickening of the root of the penis, which persisted for 4 months.

Postoperatively, erections during sleep occurred in 14 patients. Patency of the anastomosis was established in 15 patients by a palpable pulse at the anastomosis or arteriography performed between the 12th day and 4 months after operation (Fig. 3).

Three patients developed the complication of priapism. One of these, a 63-year-old man with a 3-year history of impotence following total prostatectomy, had persistent erection without pain or edema for 48 hours after operation, at which time we partially occluded the epigastric artery under local anesthesia to decrease the blood flow rate from 70–120 ml/min to 35–45 ml/min. The persistent erection subsided. A second patient experienced alternating periods of semi- and full erection on the third postoperative day, which progressed to priapism with pain and edema by the seventh day. Arteriography showed a block of venous outflow with retention of contrast in the cavernous body. The anastomosis was re-explored, and the blood flow in the shunt was found to have decreased from 75 ml/min to 10 ml/min. The shunt was ligated and the erection subsided. A third patient, aged 63, developed priapism on the day after his discharge from the hospital, and he returned 48 hours later complaining of pain. A venous bypass operation using the greater saphenous vein according to the method of Grayhack [5] was then performed, and the priapism subsided immediately. Semierrection reappeared with compression of the venous bypass. Three weeks later (5 weeks after the first operation) priapism again developed and the arterial bypass was ligated.

Of 13 patients with a patent anastomosis and without priapism, 9 resumed normal sexual activity, 8 within 2 to 7 weeks postoperatively and 1 after 3 months. An additional 2 patients experienced an improvement in their capacity to develop erection.

In 2 patients there was little improvement despite a patent anastomosis. One of these was a man with a 15-year history of impotence following aortoiliac and aortofemoral bypass surgery. Pelvic arteriography



Fig. 2. Right-sided epigastricocavernous anastomosis. On the left side of the photograph there is the common femoral artery with the origin of the inferior epigastric artery from it. On the right side of the photograph there is the anastomosis of the mobilized epigastric artery to the cavernous body. (From Michal, Kramar, Pospichal, Hejhal, *Sexualmedizin* 5:15, 1976. Reprinted by permission of the publisher.)

preoperatively showed no filling of the pelvic arteries. Two months after operation he reported inability to have an erection, even during sleep, and we have since lost contact with him. The other patient who failed to improve despite a patent anastomosis had diabetes, involution of the penis, and negative responses on electrocapacitance plethysmography prior to operation.

Discussion

Results of arterial epigastricocavernous anastomosis should be evaluated first in terms of the theoretical justification for such a procedure, and then in terms of the indications, technique, complications, and effect on sexual impotence. Histological [6] and arteriographic [4, 6] studies of the penis have shown that organic vascular changes may play a significant role in limiting the capacity of the organ to increase its blood flow, and that these organic changes may be of importance in the etiology of sexual impotence.

Newman, Northup and Devlin [7] reported that erectile levels of cavernous body blood flow were 20–50 ml/min in 5 young volunteers and 15 fresh cadavers. Our studies have shown that these levels vary from 45–170 ml/min, apparently in relation to penile size [4, 6]. The mean value from 33 observations was 92 ml/min. After obtaining erection with

such infusion tests, it was possible to decrease flow to 50–70% of threshold values with maintenance of erection. Observations were carried out as part of phalloarteriography [4, 6], during surgery in the last 7 patients of the present series, and in 1972 in 5 fresh cadavers.

Normally, threshold flow levels for erection are achieved by increasing arterial flow into the cavernous bodies. When the capacity to increase flow is substantially limited there are volume changes of the penis and erection cannot be achieved. The purpose of the arterial bypass procedure is to bring basal blood flow closer to erectile value, i.e., to 50–60% of the threshold flow rate necessary to initiate erection. The target flow rate is approximately 45–60 ml/min, which is about half the mean threshold of 93 ml/min. Flow rates equal to or above the threshold values for maintaining erection have the risk of producing priapism. If the bypass flow rate is too low, the desired effect is not achieved and occlusion of the shunt is likely.

After experimental testing of the technical feasibility of a direct arterial anastomosis to the cavernous bodies of the penis [1, 2], it was these theoretical considerations that determined the choice of the inferior epigastric artery. Other possible solutions, such as femorocavernous venous bypass, were considered to carry too great a risk of priapism from too high a

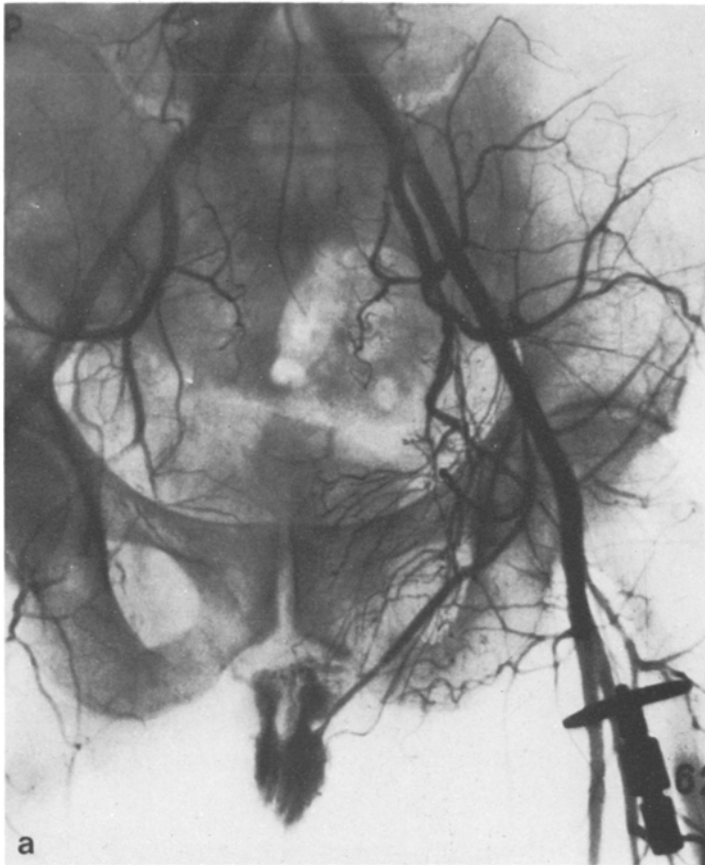


Fig. 3. a. Initial stage of postoperative arteriography showing filling of afferent arteries, anastomosis, and cavernous bodies. **b.** Late stage of postoperative arteriography showing contrast medium in cavernous body and venous return.

basal flow rate. Flow rates from the cut end of the epigastric artery can be measured during surgery by allowing free flow into a calibrated vessel. Since the pressure in the cavernous body is about 10 mm Hg, it is a valid procedure to adjust the flow rate in the dissected artery to a rate just below that necessary to maintain an established erection (not to initiate the erection). Adjustment can be made by dilating or stenosing the arterial segment.

By the use of arteriography we are now able to localize the site of arterial flow impediments fairly precisely [4]. Electrocapacitance phalloplethysmography helps to estimate reactivity to erotic stimuli and determine that reflex pathways are intact. If there is no reaction to erotic stimuli and if spontaneous activity is reduced, a direct arterial anastomosis cannot be expected to restore sexual potency. Further development of quantitative diagnostic techniques, more precise indications, perfection of the surgical technique, and various modifications are a matter of continued investigation.

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Résumé

Précédemment, des études histologiques et artériographiques des artères de la verge nous avaient donné l'impression que les sténoses et occlusions de ces artères jouaient un rôle très important dans l'étiologie de nombreuses impuissances sexuelles. Nous avons, chez 21 hommes âgés de 40 à 63 ans et

atteints d'impuissance, réalisé, avec des techniques de microchirurgie, une anastomose directe entre l'artère épigastrique et les corps caverneux. Le but de l'opération est d'élever le débit sanguin de base jusqu'à un niveau juste inférieur à ce qui est nécessaire pour obtenir l'érection. Ce niveau est déterminé par les études préopératoires. Il suffit alors d'un accroissement modéré de débit en réponse à un stimulus érotique pour que l'érection soit obtenue. Les complications ont été 6 thromboses de l'anastomose et 3 priapismes. Chez 13 malades, l'anastomose est restée perméable et chez 11 l'érection est améliorée: 9 d'entre eux ont une activité sexuelle normale.

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