

## Aortofemoral Surgery and Sexual Function

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**Objectives:** To determine the incidence and pathophysiology of erectile dysfunction (ED) in patients with aortoiliac occlusive disease (AIOD) and the effects of aortofemoral surgery, including endarterectomy (E) and reconstruction (R), on erectile function (EF).

**Design:** Evaluation of EF before and 3 months after surgery.

**Methods:** 31 out of 40 male patients scheduled for aortofemoral surgery were given multiple choice questionnaires and penile dynamic Colour Doppler Ultrasonography.

**Results:** Of the 31 who agreed to enter the study five (16%) were found to be potent and 26 (84%) to suffer from ED. This was purely arteriogenic in 8% of the cases, purely venogenic in 23%, combined arteriogenic and venogenic in 53%, and neurogenic in 16%. Twenty patients returned for postoperative evaluation of EF, nine who had undergone E and 11 who had undergone R. Improvement of EF, in terms of increased penile arterial inflow, occurred in seven patients, six who had undergone E and one who had undergone R. EF remained unchanged in nine patients, three who had undergone E and six who had undergone R. Deterioration of EF occurred in four patients, all who had undergone R, and was attributable to decreased arterial inflow in two cases and to neurogenic surgical injury in the other two.

**Conclusions:** The majority of patients with AIOD suffers from ED. Reduced penile arterial inflow and cavernovenous leakage are equally important in the pathophysiology of ED in patients with AIOD, suggesting that atherosclerosis may also compromise the penile veno-occlusive mechanism. Endarterectomy seems more likely than reconstruction to improve or maintain EF.

**Key Words:** Erectile function; Erectile dysfunction; Impotence; Aortofemoral surgery; Colour Doppler Ultrasonography

### Introduction

Although sexual impotence in male patients with aortoiliac occlusive disease (AIOD) was described by Leriche as early as 1923, little effort has been made to clarify the incidence and pathophysiology of this phenomenon. The reported incidence ranges from 25–75% in different series<sup>1,2</sup> probably due to definition bias and lack of objective evaluation of erectile function (EF). Most of the available studies are based only on questionnaires, i.e. subjective data, and only distinguish between potent and impotent males without taking into account the degree of the erectile dysfunction (ED).

Reduction of blood flow in the penile arteries due to atherosclerotic obstruction of the internal iliac artery and/or of the aortoiliac tract is supposed to be the major pathophysiological factor of ED in patients with AIOD,<sup>3</sup> but diabetic neuropathy, cavernovenous leak-

age (CVL) and even psychogenic factors might also be involved.

It has been recently recognised that surgery for AIOD can both restore or adversely affect EF in different patients.<sup>4</sup> Restoration can occur in case of increased blood flow in the penile arteries, while deterioration can occur in case of decreased blood flow in the penile arteries or due to damage to the hypogastric plexus during aortic preparation. While little information is available on the incidence of restoration of EF after surgery, the incidence of deterioration ranges from 0–80% in different studies.<sup>5,6</sup> Again this is probably due to definition bias and lack of objective evaluation of EF.

Penile dynamic Colour Doppler Ultrasonography has proved to be a fundamental diagnostic tool in the work-up of patients with ED as it provides objective and reliable data on both haemodynamic factors: arterial inflow and the veno-occlusive mechanism, involved in EF.<sup>7–10</sup> Being possible an objective and reliable determination of EF, a prospective study was

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designed to determine the incidence and pathophysiology of ED in patients with AIOD and the effects of the two currently performed aortofemoral surgical procedures, reconstruction (R) and endarterectomy (E), on EF.

### Patients and Methods

The study plan was approved by the Ethical Committee of the Hospital. From December 1991 to May 1993, male patients scheduled for aortofemoral surgery at our Department were asked to participate in this study. The aims and methods of the study were carefully explained by one of us and informed consent was obtained before enrolment.

Preoperative assessment of EF was performed the day before surgery and consisted of a questionnaire and penile dynamic Colour Doppler Ultrasonography. Factors possibly affecting erectile function, like diabetes mellitus, renal or liver failure, and medications were carefully investigated and recorded when present. Also preoperative aortofemoral angiographic findings were recorded. The degree of stenosis of the aorta, common iliac, internal iliac and external iliac arteries was graded as 0 (no stenosis), grade I (stenosis with <50% reduction in diameter), grade II (stenosis with >50% reduction in diameter), and grade III (complete occlusion).

The choice between E and R was made on an individual basis according to the personal preference of the operating surgeon (ML, OL). Reconstruction was performed transperitoneally. The distal aorta was dissected free. The aortic stump was endarterectomised as appropriate and anastomosed end-to-end to the graft. The graft was then anastomosed end-to-end to common iliac arteries or it was tunnelled to both inguinal regions and anastomosed end-to-side either to common femoral artery or to the ostium of the profunda femoris artery.

A similar approach was used for endarterectomy and the whole right common iliac artery and the left iliac bifurcation as well as both femoral bifurcations exposed. Open endarterectomy was performed on exposed areas whereas both external iliac arteries as well as left common iliac artery were endarterectomised blindly. Cuff endarterectomy was performed for internal iliac arteries if necessary.

Postoperative evaluation of EF was performed three months after the surgical procedure and consisted of another questionnaire and penile dynamic Colour Doppler Ultrasonography.

**Table 1. Grading of the penile response to intracavernous injection of the vasoactive agent**

Grade I	no change
Grade II	mild tumescence
Grade III	tumescence without rigidity
Grade IV	partial rigidity
Grade V	full rigidity

### Penile dynamic Colour Doppler Ultrasonography

After intracavernous injection of 40 µg prostaglandin E1 (PGE1), the right and left cavernous arteries were identified at the level of the peno-scrotal angle; peak systolic velocity (PSV) and resistance index (RI) were recorded at 3, 10 and 20 min after injection. At the same times, the penile response to intracavernous injection of the vasoactive agent was subjectively evaluated and graded (Table 1) by the investigator. All exams were performed by the same investigator (LC). A PSV lower than 25 cm/s was considered suggestive of arteriogenic ED while a RI lower than 0.80 was considered suggestive of venogenic ED.

### Statistical analysis

The Fisher's exact test was used to analyse the effects of the two surgical procedures on EF. Significance was set at  $p \leq 0.05$ .

### Results

Forty patients were asked to enter the study; nine refused claiming not to be interested in sex anymore! The remaining 31, aged 31–81 years (mean 63 years) underwent preoperative evaluation of EF: five (16%) were found to be potent, eight (26%) to be completely impotent, and 18 (58%) to have an impaired EF (weak erections). As summarised in Table 2, the ED was attributable to reduced arterial inflow in only 8% (2/26) of cases, to combined reduced arterial inflow and CVL in 53% (14/26), to CVL alone in 23% (6/26), and to diabetic neuropathy in 16% (4/26). Because of these various aetiological factors, EF did not correlate with angiographic findings of internal iliac artery patency (Table 3); of the 13 patients with a good patency, five had an impaired EF and three were impotent.

Sixteen patients underwent R while fifteen underwent E. Two patients were not scheduled for post-

**Table 2. Results of the preoperative evaluation of erectile function**

Erectile function	Aetiology of the erectile dysfunction				Total
	Neurogenic	Arteriogenic	Cavernovenous	Mixed	
Normal	–	–	–	–	5
Reduced	0	2	5	11	18
Absent	4	0	1	3	8
Total	4	2	6	14	31

Neurogenic: absence of spontaneous erections + long-lasting diabetes mellitus + grade IV/V penile response to intracavernous injection of the vasoactive agent. Mixed: combined arteriogenic and cavernovenous deficiency.

operative evaluation of EF as one, who had undergone R, died 3 days after surgery because of rupture of the proximal anastomosis, while the other, who had undergone E, had a cerebral stroke with consequent hemiplegia on the seventh postoperative day. Nine patients scheduled for postoperative evaluation of EF did not attend. When contacted by phone, they all claimed not to be interested in sex or re-examination anymore. Thus, only 20 patients underwent post-

operative evaluation of EF and the results are summarised in Table 4. Objective improvement of EF, in terms of increased penile arterial inflow occurred in seven patients, six who had undergone E and one who had undergone R. Of the six patients who had undergone E, one had no subjective improvement of EF as he had a neurogenic ED due to diabetes. Objective deterioration of EF occurred in four patients; all of them had undergone R and all of them also had

**Table 3. Preoperative erectile function in relation to patency of the internal iliac arteries**

Erectile function	Patency of the internal iliac arteries			Total
	Good	Fair	Poor	
Normal	5	0	0	5
Reduced	5	9	4	18
Absent	3	3	2	8
Total	13	12	6	31

Good: up to grade I/I of stenosis of the internal iliac arteries; Fair: up to grade II/II of stenosis of the internal iliac arteries; Poor: up to grade III/III of stenosis of the internal iliac arteries.

**Table 4a. Chances of endarterectomy and reconstruction improving erectile function**

Erectile function	Aortofemoral surgical procedures			Significance*
	Endarterectomy	Reconstruction	Total	
Improved	6	1	7	<i>p</i> =0.132
Unchanged/decreased	3	5	6	
Total	9	6	15	

\*Fisher's exact test. Patients with normal EF preoperatively were excluded.

**Table 4b. Chances of endarterectomy and reconstruction worsening erectile function**

Erectile function	Aortofemoral surgical procedures			Significance*
	Endarterectomy	Reconstruction	Total	
Improved/unchanged	6	4	10	<i>p</i> =0.07
Decreased	0	4	4	
Total	6	8	14	

\*Fisher's exact test. Patients with absent EF preoperatively were excluded.

a subjective deterioration of EF. Deterioration was attributable to decreased arterial inflow in two cases and to neurogenic surgical injury in the other two. EF remained unchanged in nine patients, three who had undergone E and six who had undergone R. Overall, E appeared safer than R for patients in terms of improved or maintained EF but this difference did not reach statistical significance (Table 4a and 4b).

In the nine patients who had undergone E, the internal iliac arteries were revascularised directly. In the 11 patients who had undergone R, the internal iliac arteries were revascularised directly in five cases, and retrogradely via the femoral arteries in four. In one patient one artery was revascularised directly while the other was not revascularised at all; in another patient none of the two artery was revascularised. Postoperative penile dynamic Colour Doppler Ultrasonography showed that penile arterial inflow did not correlate with revascularisation of the internal iliac arteries.

### Discussion

Penile dynamic Colour Doppler Ultrasonography is the cornerstone in the work-up of patients with ED as it provides objective data on both haemodynamic factors: arterial inflow and the veno-occlusive mechanism, involved in EF. In association with a well-arranged questionnaire and a careful medical history, it is usually able to establish the aetiology of the ED since patients with normal penile haemodynamics are likely to have a psychogenic ED if they do have spontaneous erections and to have neurogenic ED if they do not. Furthermore, patients with neurogenic ED usually had significant neurological diseases, such as long-lasting diabetes mellitus, multiple sclerosis, medullary trauma, etc. Using these criteria we found that 84% (26/31) of patients with AIOD suffered from ED, a much higher incidence than that of an age-matched population, i.e. 25% at 65 years,<sup>11</sup> and even than that of patients with diabetes, i.e. up to 50%.<sup>12</sup> This is probably due to the fact that atherosclerosis is a systemic disease which may compromise EF in many ways. In our patients with AIOD, ED was purely arteriogenic, i.e. due to a reduction of the penile arterial inflow consequent to atherosclerotic obstruction of the aortoiliac tract, in only 8% of the cases, while CVL was involved in more than half of the cases. Atherosclerosis may therefore also compromise the penile veno-occlusive mechanism.

This non-randomised study confirmed that surgery for AIOD can both restore or adversely affect EF, and

provided an interesting but not statistically-significant evidence that E may be safer than R for patients' EF. E resulted in increased penile arterial inflow in two-thirds of the cases, and never decreased penile arterial inflow, whereas R resulted in increased penile arterial inflow in only 9% of the cases and in decreased penile arterial inflow in 18%. These findings are well in agreement with those by Nevelsteen *et al.*,<sup>4</sup> who reported improvement and deterioration rates of EF of 11% and 15% respectively in patients who had undergone aortofemoral R with no special efforts to maintain or improve the internal iliac blood flow. The improvement rate has been reported to rise up to 66% when direct revascularisation of the internal iliac arteries is performed in combination with aortofemoral R.<sup>6,13</sup> In the present study, however, postoperative penile arterial inflow did not correlate with revascularisation of the internal iliac arteries. This suggests that obstruction of the aortoiliac tract is only one of the various factors involved in the pathophysiology of ED in patients with AIOD. In our series, E never resulted in damage to the hypogastric plexus whereas R resulted in such complication in two (18%) of the cases. These findings are again in agreement with those of Nevelsteen *et al.*<sup>4</sup> Our study is based on a small number of patients and contains some selection bias and therefore does not justify a reliable comparison between E and R in this respect. Whatever aortofemoral surgical procedure is used extensive dissection should be avoided.

The quality of life, particularly sexual function, is a major issue for many patients as proven by the fact that some men are ready to choose a shorter survival to remain potent.<sup>14</sup> It is therefore our opinion that patients scheduled for aortofemoral surgery for claudication and showing an interest in sex should undergo preoperative evaluation of EF. Patients with purely arteriogenic or combined arteriogenic and cavernovenous ED, may experience improvement of EF after surgery; this should be kept in mind and E should be preferred to R, providing the two procedures are both suitable. Patients with neurogenic or purely cavernovenous ED are unlikely to experience any improvement of EF after surgery; in these patients the surgical procedure may be chosen independently on its effect on EF.

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