

## SUPRARENAL AORTA RECONSTRUCTION USING A SAPHENOUS SPIRAL GRAFT: CASE REPORT

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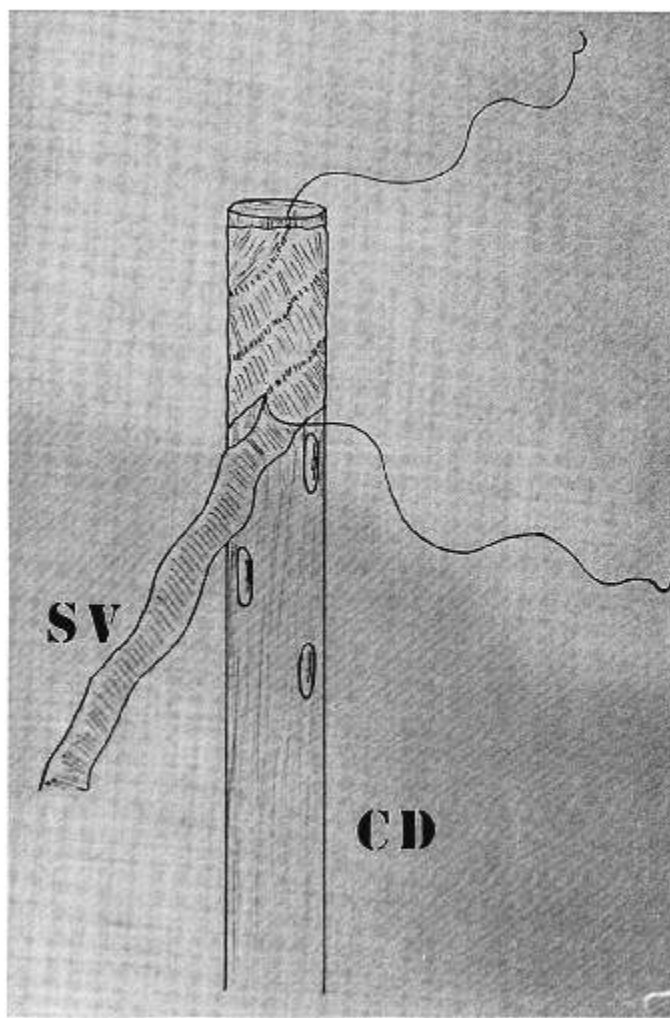
**We report a case of gunshot wound to the suprarenal aorta with restoration of blood flow through a saphenous spiral graft in an 18-year-old man. He was followed for a period of 27 months. The follow-up showed a progressive dilatation of the graft. This original technique for wounds of the aorta seems a reasonable alternative for trauma cases in which there is no vascular prosthetic graft.**

THIS ARTICLE presents the case of a patient with a gunshot wound to the suprarenal aorta in whom we used a saphenous spiral graft to replace a destroyed segment of the aorta. We also emphasize the technique of the surgical exposition used, with rotation of the abdominal contents to the right side, from the reflection of the left colon and section of the left diaphragmatic column.

### CASE REPORT

An 18-year-old man was treated at Pronto Socorro Municipal Hospital, Porto Alegre, Brazil, on April 20, 1990, for hypovolemic shock because of a gunshot wound of the left lumbar region. We performed an exploratory laparotomy through a median incision, and found a large amount of retroperitoneal bleeding in the upper abdomen. We then exposed the aorta through the paracolic gutter, dislodging the spleen, pancreas, stomach, and left colon, leaving the left kidney in situ. We clamped the proximal and distal segments of the aortic wound, after sectioning the left diaphragmatic dome. The aorta had a star-shaped wound at the level of the celiac axis, where the aorta was transected, and there was a transfixing lesion of the liver and stomach. Primary suture of the aortic lesion was unsuccessful. We then resected the aortic segment and removed approximately 20 cm of the saphenous vein of the left thigh. After distending the vein segment with physiologic saline we cut it longitudinally over its length, and constructed a spiral graft approximately 5 cm long, using a continuous suture of 5-0 polypropylene monofilament and a 40F chest drain as a mold (Fig. 1). We then sutured the graft end-to-end between the two ends of aorta with 5-0 polypropylene suture.

The arterial clamp was withdrawn gradually over approximately 8 minutes, during which time we noted that the graft was working well. The celiac axis stump was attached with 4-0 polypropylene suture. The total aortic clamp time was 90



**Figure 1.** Diagram of saphenous spiral construction. SV = saphenous vein; CD = chest drain.

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minutes. We did not use heparin or any other maneuver to protect the abdominal viscera. Five units of blood were used during the surgery, and cefalothin 1 g IV every 6 hours for 5 days was given as a prophylactic antibiotic.



**Figure 2.** Ultrasonogram on sixth postoperative day showing the abdominal aorta and the graft (21 mm).



**Figure 3.** Aortogram on the twenty-first postoperative day showing the graft (lateral view).

The patient's course was without complications, and an ultrasonographic study on the sixth postoperative day showed integrity of the graft which had a diameter of 21 mm (Fig. 2). The patient was discharged, asymptomatic, on the seventh day.

An aortogram on the twenty-first postoperative day showed a small amount of dilatation of the graft and retrograde filling of the celiac axis throughout the superior mes-



**Figure 4.** Aortogram showing the graft (frontal view).

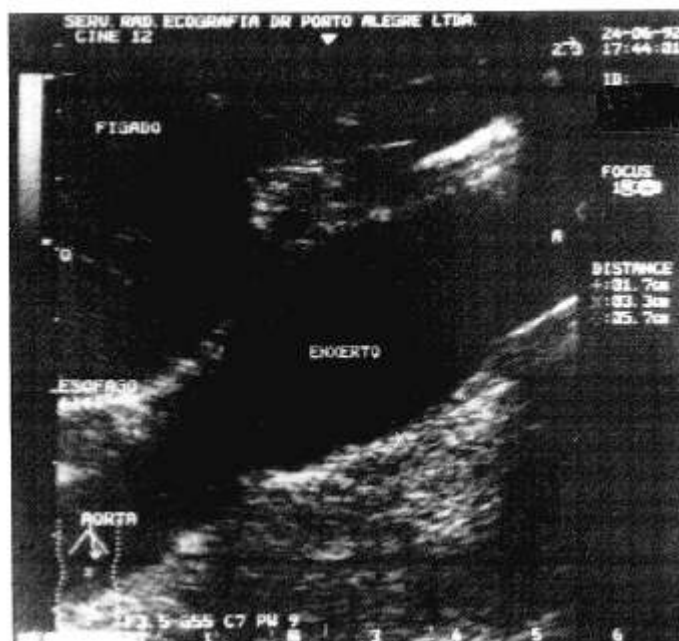
**Table 1**  
Proximal aorta and graft diameters on ultrasonography

| Date             | Graft (mm) | Aorta (mm) | Index |
|------------------|------------|------------|-------|
| April 27, 1990   | 21         | 15         | 1.4   |
| November 5, 1991 | 29         | 16         | 1.81  |
| June 24, 1992    | 33         | 17         | 1.94  |

enteric artery (Figs. 3 & 4). The patient underwent periodic ultrasonographic studies of the graft. We used a dilatation index calculated by dividing the diameter of the graft by the diameter of the proximal aorta, because this segment of the aorta should not be modified by the blood flow (Table 1). The interval between the first and second ultrasonographic studies was long because the patient disappeared for 17 months.

The analysis of the dilatation index showed a pattern of slow and gradual enlargement of the graft's diameter (21 mm to 33 mm), but the proximal aorta also showed a slight increase in diameter (15 to 17 mm) (Figs. 5 & 6). The increase in the dilatation index observed between 1990 and 1992 led us to decide to do a definitive substitution of the venous graft with a Dacron graft. The procedure was performed 27 months after the first procedure. A left thoracoabdominal incision was made at the level of the eighth intercostal space. The abdominal approach was extraperitoneal; the aorta and superior mesenteric artery were isolated. Before aortic clamping, systemic heparinization and insertion of a left axillary-femoral shunt were performed.<sup>1</sup> The venous graft was then opened longitudinally and the Dacron prosthesis (18 × 65 mm), which had been pre-coagulated, was fixed with uninterrupted 3-0 polypropylene suture (Figs. 7 & 8). Macroscop-





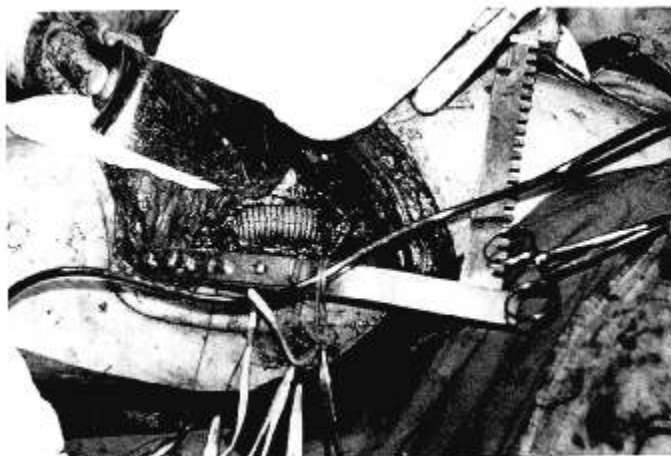
**Figure 6.** Ultrasonogram at the twenty-sixth month of the postoperative period showing dilatation of the graft (33 mm).



**Figure 7.** During the second surgery, we could see that the graft had lost its spiral aspect.

(25%), and end-to-end anastomosis (18%). Ligation of the celiac axis is well tolerated when the patient has no superior mesenteric artery obstruction.<sup>18,31</sup> The use of synthetic prostheses in contaminated surgical fields is still debated, and there is no agreement.<sup>31</sup> When a Dacron prosthesis is used without pre-coagulation there is a hazard of bleeding, mainly in patients who have undergone many transfusions, who have metabolic acidosis, and consequently have coagulation deficits.<sup>35</sup>

When it is necessary to replace a segment of suprarenal aorta, its diameter, ranging from 12 to 20 mm, can thus impede the use of a venous graft, unless a tube or spiral or saphenous vein is constructed. In this way, the technique of constructing a saphenous spiral graft is very attractive, because the graft can be constructed with the



**Figure 8.** Dacron graft sutured end-to-end at the supramesenteric aorta.

appropriate diameter and extension. Construction of this spiral was first described experimentally by Chiu et al.<sup>36</sup> in 1974, and applied to humans by Doty and Baker<sup>37</sup> in 1976, to bypass an obstruction of the superior vena cava caused by a tumor. Later, it was used successfully in reconstruction of venous lesions.<sup>38-40</sup> We found no reports of its use in aortic reconstruction after trauma in our literature review.

Despite the success of this case, more experimental studies are needed. Because these grafts do not carry the risk of infection attributed to prosthetic grafts and they have an impermeable wall, they could be used in aortic wounds that have heavy peritoneal contamination or in patients with transfusional coagulopathy. However, the unavailability of a vascular prosthesis, at the moment of a lifesaving surgery, which is very common in our country, is the best indication for using this technique. Finally, we emphasize that once the technique has been employed, the patient should be observed carefully for aneurysm formation at the graft site.

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## EDITORIAL COMMENT

In the preceding article, Doctor Farret and his associates not only report successful management of a complex case under very difficult circumstances, they also give an excellent review of the literature, present a succinct discussion, and identify several salient issues. The authors clearly state that a spiral autogenous saphenous graft is used when no alternative is available. In most operating rooms, some form of synthetic and appropriately sized prosthesis is the conduit of choice when one is faced with an injury of the complexity reported herein. This case again documents that ligation of the celiac axis is usually tolerated. The fate of the spiral saphenous conduit is of particular interest. Doctor Norman Rich, in his book, *Vascular Trauma*, documented at least one case of delayed dilatation of a nonspiral saphenous conduit in an arterial position. That such dilatation is not seen more often in coronary artery bypasses and other areas of high central arterial pressure is a credit to the known special physical properties of the saphenous vein. That the authors were able to construct a venous conduit of appropriate diameter and accomplish the two suture lines in a relatively short time is a credit to their skill. I know of other cases when a native (small diameter) saphenous vein was sutured into this location of the aorta with uniformly disastrous results. The mortality rate following injuries to this location continues to be more than 60%, with some noted trauma centers *never* reporting a survivor. President John Kennedy's accused assassin, Lee Harvey Oswald, had an injury similar to the one described, but with an increased complexity. Although the authors point out that the area appropriate for use of prosthetic substitute conduits in contaminated surgical fields is still debated, I have *never* found (or heard) of an abdominal aortic prosthetic graft inserted for trauma becoming infected. The experimental and clinical experience in this area would even suggest that when extra-anatomic bypass is not possible, use of a synthetic prosthesis in a potentially contaminated surgical field is actually *superior* to the use of scavenged transposed collagen tubes of autogenous venous origin.

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