RETROPERITONEAL INFRARENAL AORTIC APPROACH

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ABRASTRACT

The retroperitoneal infrarenal approach is suitable for all elective operations on the abdominal aorta, particularly in patients with high-risk aneurysms and in selected patients with symptomatic and ruptured aneurysms. It has certain advantages over the other surgical techniques used in vascular reconstructive operations, concerning physiological disturbance and exposure of the entire infradiaphragmatic aorta. The application of the retroperitoneal infrarenal aortic approach is indicated in patients with high preoperative risk, hostile abdomen and concomitant pathology.

Key words: Vascular reconstructive surgery, surgical techniques, abdominal aorta, aneurysms

Introduction

The retroperitoneal infrarenal approach is suitable for all elective operations on the abdominal aorta, particularly in patients with high-risk aneurysms and in selected patients with symptomatic and ruptured aneurysms. Over the last 30 years a number of surgeons have championed the retroperitoneal approach for repair of abdominal aortic aneurysms and aortoiliac occlusive disease using a variety of incisions. Several studies attest to the clinical superiority of this approach over the transabdominal route and recent evidence demonstrates reduced physiological disturbance with this technique [1,2]. When executed properly the retroperitoneal approach can provide excellent exposure of the entire infradiaphramatic aorta. The retroperitoneal infrarenal aortic approach is considered to be approach of choice to infrarenal aneurysms. Aneurysms of the infrarenal aorta are by far most common arterial aneurysms encountered in clinical practice today: they are three to seven times more common than thoracis aneurysms and affect four times as many men as women [3]. Knowing in details the retroperitoneal infrarenal aortic approach facilitates timely and adequate surgical conduct in arterial aneurysms.

The aim of our review is to present historical data, the surgical technique and to discuss the important points of this topic.

Historical data

Since the first successful aortoiliac bypass for occlusive disease by Oudot on November 14, 1950, and the first successful abdominal aortic aneurysm repair by Dubost and his colleagues on March 21, 1951, innumerable reconstructive procedures have been performed on the abdominal aorta [1,4]. The application of the retroperitoneal infrarenal approach is connected with the 19th century`s most remarkable innovations in the vascular surgery. Actually some of the first fundamental aortic reconstuctive operations have been done by the usage of the retroperitoneal infrarenal aortic approach. In the beginning the retroperitoneal approach has been not widely used and unfamiliar to general and vascular surgeons, who, by nature of their training and by being comfortable working in the abdomen, have continued to expose the aorta transabdominally [5].

In Paris Jacques Oudot performed experimental work in vascular surgery and the preservation of arterial ho-mografts with the assistance of Jean Natali, who later became one of the leaders of French vascular surgery. On November 14th , 1950, the first successful aortoiliac bypass for occlusive disease was conducted by Oudot. He operated on a 51-year-old woman with aortic occlusion and nonhealing ulcers of the left leg. The atient did well postoperatively, but the right femoral pulse was absent. Few months later, on May 8th , 1951, Oudot performed the first crossover bypass by inserting a graft between her two external iliac arteries [4].

On March 29, 1951, Dubost became the first surgeon to resect an abdominal aortic aneurysm and replace it with a homograft. His patient was a 50-year-old man, and the operation was performed via a left thoracoabdominal retroperitoneal approach. In this year he also attempted the first renal transplant in Europe [6].

In 1963, Rob was the first to give a detailed description of the antero-lateral retroperitoneal approach and quoted advantages such as easier postoperative course but also disadvantages such as limited exposure. In the years to follow, several other surgeons have published good clinical results with various, modified retroperitoneal approaches. In 1980, Williams et al. described the extended retroperitoneal approach, which allows a better exposure not only of the infrarenal but also the pararenal and even suprarenal aorta. This publication led to a revival of the interest of the vascular surgeons and, nowadays, the retroperitoneal approach is used in many centers as a well- accepted alternative to the transperitoneal approach [7]. Within a short time period, surgeons throughout the world were duplicating and modifying DuBost's technique, establishing aortic reconstruction as the treatment of choice for AAAs. Since that time, the development and improvement of prosthetic grafts, refinements in operative technique, and improvements in perioperative intensive care and monitoring have established direct graft replacement of infrarenal AAAs as the standard of care [1].

Surgical technique

Several authors have provided detailed descriptions of retroperitoneal infrarenal aortic exposure utilizing transverse , midline , or perimedian incisions . A variety of incisions are available, all capable of providing access to the aorta and proximal common iliac arteries. Positioning the patient is very important. The left thorax should be elevated 45° to 60°. In order to have access to the right groin, the hips should lie as flat as possible. Flexing the table and maintaining the patient's position with an air-vacuum styrofoam bean bag causes the wound to spiral open. The midpoint between the right costal margin and the right iliac crest is centered over the table flexion point. With the surgeon standing on the left, the table may be rotated away (during dissection of the aorta) or toward him or her (if groin incisions are required). During closure of the incision, the table is flattened, bringing the wound edges into apposition. A transverse skin incision is made from the edge of the rectus sheath, midway between the umbilicus and symphysis pubis, 8 to 10cm into the llth intercostal space .The abdominal wall and intercostal muscles are divided in the line of the incision, taking care not to injure the llth and 12th dorsal neurovascular bundles. Damage to these nerves denervates the abdominal wall musculature leading to muscle weakness manifest by an asymmetric abdominal contour with unsightly bulging. Excising a short segment of 12th rib facilitates wound closure. The retroperitoneal space is entered at the tip of the resected 12th rib, and using blunt dissection the peritoneum is stripped from the underlying iliac fossa and psoas muscle. Peritoneum is also stripped from the undersurface of the abdominal wall, taking care, as the linea semilunaris is approached, to avoid tearing the peritoneum, which thins out and is adherent to the transversalis fascia as the midline is approached. Posterolaterally, the peritoneum is stripped from the flank, psoas muscles, and inferior surface of the diaphragm. The peritoneum and its contents are swept and retracted anteromedially. A dissection plane is developed along the lumbodorsal fascia behind the left kidney and ureter, which are further mobilized and retracted anteriorly .Alternatively, dissection may proceed anterior to the left kidney and ureter, but a major advantage of the retroperitoneal approach is partially lost because, by leaving the kidney in situ, the left renal vein obscures the juxtarenal aorta.

With the kidney and ureter retracted anteromedially, the aorta is exposed from the level of the left renal artery to the aortic bifurcation. Any self-retaining retractor firmly attached to the operating table simplifies and maintains fixed exposure and is key to maintaining such exposure. By exposing the aorta from its bifurcation to the level of the left renal vein, the left renal artery is identified at the level of the lumbar branch of the left renal vein. The lumbar branch of the left renal vein is a fairly constant structure and serves as a marker to the origin of the left renal artery. After ligating and

dividing the lumbar branch of the left renal vein, the infrarenal aorta comes into complete view. [8,9,10]

Discussion

The retroperitoneal infrarenal aortic approach is indicated in cases that require more detailed and thorough assessment of the preoperative patient`s condition and his/her concomitant diseases. The indications related to the patient include: hostile abdomen - multiple previous laparotomy, obesity, peritoneal dialysis, patients at high-risk for operation (not generally accepted), patients with a definite colostomy , the presence of a horse-shoe kidney. Aneurysm related indications include: juxtarenal or pararenal aortic aneurysm , suprarenal extension of aortic thrombus, inflammatory aneurysm where the fibrosis is usually less developed at the side than at the front of the aorta, the presence of a horse-shoe kidney, redo aortic surgery after previous infrarenal aortic reconstruction [11]. The retroperitoneal approach and its applications has been investigated by several authors through the years. Since the first successful retroperitoneal aortic reconstruction was reported by Oudot[8] in 1950, controversy has surrounded its use in elective abdominal aortic operations. The technical advantages of the retroperitoneal approach include: the avoidance of adhesions from prior abdominal operations, the easier exposure in patients who are obese, the improved exposure of the aortic "neck" in large aneurysms, the easier juxtarenal and suprarenal aortic control, the safer repair of inflammatory aneurysms, and the greater safety in patients with certain renal vascular anomalie [12,13]. The physiologic advantages of the retroperitoneal approach include: decreased postoperative ileus, decreased third space fluid loss, reduced hypothermia, fewer hemodynamic stresses, decreased pulmonary compromise, faster recovery, and fewer overall complications. These potential physiologic benefits are thought to result from the fact that the peritoneal cavity is not violated and that its contents not manipulated, which thereby results in diminished heat and evaporative losses, less third space fluid losses, decreased postoperative pain, and reduced compromise of pulmonary and gastrointestinal function [11-15]. Apart from this, it should be realized that the retroperitoneal approach has also several disadvantages: 1.When compared with transperitoneal approach it is quite time consuming, which makes it less attractive in emergency situations. 2.Exploration of the abdominal cavity is difficult if not impossible. 3.Redo-operations might present a problem. 4. Reimplantation of the inferior mesenteric artery is made more difficult. 5.Access to the right common iliac artery and its bifurcation is cumbersome. The same goes on the right renal artery. 6. Retroperitoneal approach might be contra- indicated in the presence of venous anomalies such as doubled or left caval vein [11].

Patients in high-risk categorized as ASA class IV has a significant decrease in morbidity when the retroperitoneal approach is used instead of the transabdominal approach. Actually patients of ASA class IV who underwent aortic reconstruction with the retroperitoneal approach had a significant reduction in postoperative pain and in gastrointestinal and cardiac complications, which resulted in a shortened hospital LOS and health care cost savings. Proponents of the retroperitoneal approach also cite other physiologic advantages. They note decreased physiologic trespass by not traversing the peritoneal cavity. Theoretically, this accounts for decreased pulmonary and decreased cardiac complications. It also may account for a quicker return of bowel function. The retroperitoneal approach avoids the midline incision and the associated bowel dilation and rectus spasm that may cause severe discomfort that can hinder patient mobilization, pulmonary toilet, and resumption of gastrointestinal tract function.

Conslusion

Retroperitoneal aortic approach simplifies the exposure of infradiaphragmatic aorta and when executed properly is associated with considerably less postoperative complications and less physiological disturbances which results in less hospital stay and speedy recovery and faster return to patient`s everyday life. In summary, the retroperitoneal approach can justifiably be considered

the approach of choice for technically demanding aortic reconstructions connected with lower morbid rate and incidence of postoperative complications.

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