

Abdominal Aortic Aneurysm—Total Laparoscopic Repair versus Endovascular Aneurysm Repair: EVAR Is the Best Choice

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Two randomized trials have clearly shown the short-term superiority of endovascular aneurysm repair (EVAR) over open surgery in the treatment of abdominal aortic aneurysm (AAA) in the normal risk patients. The mortality was reduced three-fold from 4.7 to 1.6%, postoperative complications were less frequent and less severe, the stay in the ICU and the total length of stay in hospital were dramatically reduced. So were the needs for transfusions.

Longer-term results of these trials show that the 3- to 4-year mortality rates are similar in both groups and that EVAR is less durable than open surgery. Fifteen percent to 25% of patients with EVAR require some kind of complementary procedure. Eighty percent of these complementary procedures can be performed endovascularly. Another major drawback of EVAR is the need for a burdensome lifelong surveillance program. However, due to early advantages and the hope that newer generation grafts will offer better results, one might expect that EVAR will become the “gold standard” treatment for abdominal aortic aneurysms.

Change in Trend?

Will laparoscopic repair change this trend? We are not at all convinced. Owing to the lack of randomized studies, we have to analyze the pros and cons of both techniques in terms of expertise, technical environment, applicability and patient selection, effects of the operation on the patient's physical status, early and late results, and the consumption of hospital resources.

Expertise and Training

The promoters of laparoscopic training techniques acknowledge that a minimum of 50 cases should be performed before a physician can be considered as fully trained. As for any new procedure, a relatively large amount of experience is required to acquire the technical skills and to select cases properly. It is noteworthy that most of the series reported in the literature do not reach this figure.

Interestingly, the majority of early pioneers of vascular laparoscopy have given up the totally laparoscopic approach in favor of a video-assisted mini-laparotomy. This option reduces some of the technical challenges of totally laparoscopic repair. Although dissection of the arterial trunk is relatively simple, arterial sutures remain challenging. The instruments that are currently available to perform the aortic sutures have not yet been sufficiently perfected. Mechanical sutures or robotic surgery will probably facilitate the aortic sutures in the future, but these new developments are still in their infancy. Thus, as yet, the difficulty of total laparoscopic is one of the factors that limit the extension of the technique.

EVAR, on the contrary, is no longer an experimental technique performed in selected centers of expertise. Training still remains essential. The French ANAES experts have considered a minimum of 30 cases as the lower limit for a vascular surgeon to be fully trained. However, the anatomical indications and the different steps of the procedure are currently well defined and taught. The technique has gained in popularity and is currently applied to a majority of patients in certain states or countries (eg, State of New York, Australia, Italy, Germany, Belgium).

Technical Environments

Laparoscopic aortic surgery does not require a specific environment. The technical units and instruments are those currently used by other specialties such as urology, general surgery, and gynecology. Cost of specific vascular instruments such as clamps is reasonable.

EVAR requires good imaging which is currently provided by most of the modern C-arm units available in the OR. However, when dealing with difficult cases, all endovascular tools should be available. Special equipment is then mandatory. Stent grafts in a great variety of lengths and diameters, stents, catheters, wires, and balloons should be ready for use in a room close to the OR. The staff must also be aware of radioprotection issues.

Applicability and Patient Selection

The applicability of laparoscopy is still not well defined. High-risk patients do not seem to benefit from the technique. Calcified lesions remain contraindications. Obese patients are not good candidates. Finally, only relatively easy cases can be offered the technique. Unfortunately the technique is not applicable to the patients who most need a minimally invasive technique.

EVAR is applicable to the vast majority of patients with AAA. The only limitation is the proximal neck, which should be long enough and free from thrombus or circular calcifications. The use of aorto-uni-iliac grafts and hybrid techniques has overcome many of the former contraindications linked to the iliac arteries. So far between 50 to 70% of patients are anatomically suitable for EVAR.

Intraoperative Effects of the Techniques on the Patient's Physical Status

Laparoscopic surgery requires a general anesthesia. The insufflations of 3 to 4 L of CO₂ into the peritoneum are probably not innocuous in patients with a case history of pulmonary or cardiac disease. The clamping of the aorta has the same drawback as with the open

technique. Finally, the duration of the operation (including clamping time) is still much longer than for open procedure. The only theoretical advantage is the fact that the bowel is maintained within the abdominal cavity, limiting fluid loss and temperature drop. However, a retroperitoneal incision offers the same advantages. EVAR, on the other hand, can be performed under local anaesthesia. The abdomen remains untouched. With the closure systems currently available, the procedure can be performed percutaneously and no clamping of the aorta is required. The duration of the operation is short in many cases. In our series of 485 cases, the mean duration was 80 minutes, but easy cases can be performed in less than 1 hour.

Early Results

With totally laparoscopic approach the mortality rate is over 6% even in the best trained hands. The mortality rate for open surgery for good risk patients in randomized trials was in the range of 5%.

A comparison of the complication rate, bleeding, and use of ICU did not show any obvious differences between the open and laparoscopic techniques. Conversely, a normal bowel movement is restored faster with laparoscopic surgery. A shorter duration of hospitalization was also reported.

The early mortality for EVAR is currently less than 1.5% even when high-risk patients are included. Less than 10% of patients require intensive care. Then hospital stay is around 4 days but some patients can be treated on an out-patient basis. General complications as well as vascular complications remain rare.

Late Results

The proponents argue that laparoscopic surgery will provide the same long-term results as open surgery and much better results than EVAR. This is only speculation, which is not proven by the current figures. Limb thrombosis appears fairly frequently after laparoscopic surgery. This is understandable since the positioning of the graft is more difficult. Even if no cases have been reported so far, we suspect that the technique may be associated with a greater risk of duodenal fistula since the peritonization is more demanding. The rate of ureteral injuries is also unknown. Sexual dysfunction will be in the same range as with open surgery. Finally, the limitation of the impact on the parietal wall is the most obvious remaining advantage of laparoscopic surgery. Following open surgery, hernias are frequent after midline incision and left abdominal wall palsies are not rare after retroperitoneal incisions. However, the risk of small bowel volvulus is probably unchanged.

The 10-year results of EVAR are currently available with the very first generation grafts. We know that migration, endoleaks and limb occlusion are the limitations of the technique. However, the more recent grafts offer much better results. Hooks have reduced the risk of migration and type I proximal endoleak to less than 0.5%. Minor revisions for kinked graft and type I and type II endoleaks can be performed endovascularly with no added mortality. Finally, failed stent grafts can be repaired with a new stent graft placed inside the former one which has dramatically reduced the rate of surgical conversion. Obviously with EVAR there is no parietal side effect. The complications linked to the groin approach are the same with both techniques.

Hospital Resource Consumption

Laparoscopic surgery entails a greater cost than open surgery in terms of video equipment and instruments. A benefit that stills remains to be demonstrated is the reduction of the cost of hospitalization.

EVAR dramatically reduces the consumption of hospital resources, notably by shortening the ICU stay. So far, the cost of the stent graft and follow-up may outweigh the early benefit, but we can hope that with the enlarging market and the competition between companies, the cost of the grafts will decrease in the future.

Conclusions

There are many points indicating that EVAR is currently the best proven treatment for AAA as compared to total laparoscopic repair. We concede, however, that laparoscopic repair is still in its infancy and that improvement in instrumentation may change this current view. So far laparoscopic surgery should be considered a purely experimental technique and should not be performed outside well-designed trials.