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COMBINED STRATEGY IN AAA ELECTIVE TREATMENT

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The authors describe surgical treatment for high risk patients with abdominal aortic aneurysms of complicated morphology for standard endovascular repair. This was achieved by combining endovascular stent-grafting for aneurysmal sac exclusion with conventional vascular surgical procedures.

INTRODUCTION

The primary association of the methods and procedures of intervention radiology and of conventional surgery, called combined strategy (CS), may be utilised in all fields of surgery. In particular, CS is of unquestionable importance in vascular surgery and it has also found its place in abdominal aortic aneurysm (AAA) treatment[1–5].

At present, there are two AAA treatment options – open surgery (OS) and endovascular repair – stentgrafting (EVAR)[6,7]. Each method has disadvantages leading to its limitations as well as advantages. The disadvantages of OS include its hemodynamic intensity (the aorta clamping method), which limits its indication to low risk patients (ASA II, II-III)[8–12]. The main disadvantage of EVAR is the existing design of the stentgraft systems, which limits its utilisation to AAA with suitable morphology of aneurysm and iliac arteries[13–15]. On the other hand, AAA OS has almost no technical limitations, and hemodynamically stressless EVAR (the non-aorta clamping method) is also acceptable for high operating risk patients (ASA III, IV)[9–12,16,17].

It is a question what treatment option to offer to high risk patients who cannot be treated by conventional surgery (up to 53 % of patients) and who have AAA of complicated morphology which cannot be treated by standard endovascular methods at all or only with a high risk of a primary technical failure, subsequent complications or secondary failure (up to 50–70 % of AAA)[14,15,18,19]. The option is to combine endovascular treatment with conventional vascular surgery[1–5].

METHODS

The combination of endovascular stentgrafting and conventional vascular surgery provides the advantages of both methods while eliminating their shortcomings. AAA is thus managed endovascularly without hemodynamic stress and the asssociated surgery enable that to happen[20,21]. *In the case of a primary association of EVAR and conventional vascular surgery beyond today's standard framework, we speak of a combined strategy in the AAA repair*[1–5].

During the primary assessment of AAA and iliac arteries with a problematic morphology, the CS is considered and subsequently planned by the angio-intervention radiologist and a vascular surgeon. In general, EVAR is actually a combined procedure. Under current conditions, a purely percutaneous procedure is not widely possible even today[22–24]. However, the creation and closing of an access to the artery and the vascular tree and the creation of the femoral-femoral cross-over bypass in aortouniiliac type of AAA exclusion, are considered a common vascular surgical standard in EVAR. Secondary additional surgical procedures refer to those which deal with complications of AAA EVAR and were not taken into account in the planning and indication of AAA for EVAR[20,21].

Indication for combined strategy

The indication for combined strategy is influenced by the clinical and technical aspects and it is highly individual. From the clinical perspective, CS is recommended in patients who are generally indicated for AAA treatment (with a good life expectancy and vitality), but who carry a high operating risk for conventional AAA open surgery repair (ASA III-IV, but without laparotomy contraindication!). Due to the higher intensity of the CS as well as to the higher morbidity, AAA with an acute indication

for the procedure (AAA > 5 cm, increase > 5 mm per 6 months, symptomatic intact aneurysm) is reserved for this method[25]. From the technical perspective, CS is indicated in AAA with a complicated morphology of aneurysm and access arteries, which do not comply with the current EVAR indication criteria[1, 2, 13–15].

Complicated AAA morphology

A complicated AAA morphology refers to a problematic aortic neck (wide, short, angulated, conical, with calcifications, with a thrombus), aorta angulation (> 60°), important visceral branches arising from the aneurysmal sac (renal arteries, superior mesenteric artery, coeliac trunk) and aneurysms reaching ambilaterally into the iliac bifurcation. Problematic access arteries have significant stenoses and tortuosity on the both iliac-femoral sides. There the stengraft cannot be introduced, extended, expanded or fixed at all or with little success, or its implantation results in the obstruction of important aortic branches with risk of organ ischemia. Standard endovascular treatment is thus not possible at all or only with a high risk of technical complications and primary or secondary treatment failure[13–15, 21, 26, 27].

Conventional vascular surgical procedures utilised in the combined strategy.

Alternative approach

The alternative approach refers to vascular access created above the inguinal ligament, created most typically with the use of an arterial prosthesis attached to the side of the common iliac artery by extraperitoneal access from a pararectal incision. The prosthesis is subsequently left in place as an iliac-femoral homolateral or cross-over bypass, thus solving not only access to the aneurysm but also the atherosclerotic stenoses in the iliac arteries. In the case of stenoses in the iliac-femoral crossover, surgical direct desobliteration may be performed. In the more proximal cases, indirect desobliteration may be applied using a Fogarty wire catheter (Fig. 1)[1, 21, 22].

Primary banding

Primary banding refers to an external ligation around the artery with an implanted stentgraft. This solves the problematic stentgraft fixation in the area of the stented aneurysmal neck anastomoses. It is inserted with a dacron strip around the artery with an endovascularly implanted expanded balloon, by extraperitoneal access (to iliac arteries) or from minilaparotomy (to aorta) (Fig. 2)[1, 3, 28, 29].

Pelvic region revascularisation

The femoral- internal iliac bypass is unilaterally created from an inguinal access for the internal iliac bed and its colateral revascularisation (Fig. 3)[1, 5].

Visceral branches of abdominal aorta revascularisation

The revascularization of the important abdominal aorta visceral branches (renal arteries, superior mesenteric artery, coeliac trunk) can be carried out by bypasses created from the iliac arteries: iliac-renal, iliac-superior

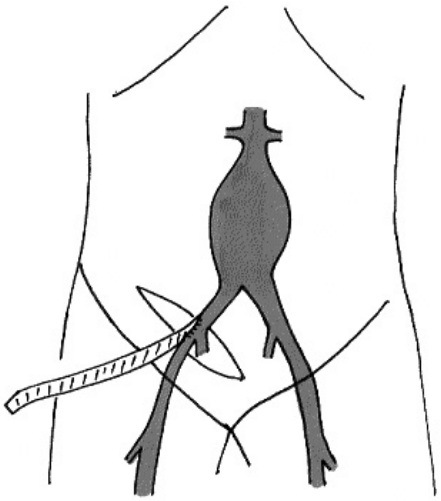

Fig. 1. Diagram of alternative access for stentgraft system introducing.

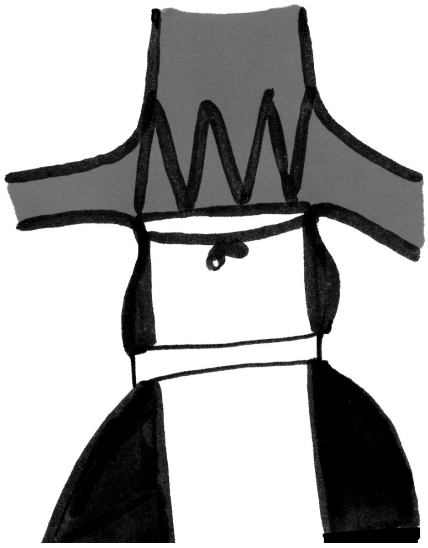

Fig. 2. Diagram of proximal aortic banding for better stentgraft fixation.

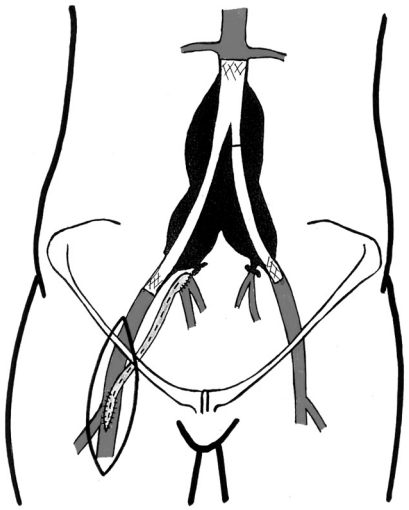

Fig. 3. Diagram of femoral-internal iliac bypass for iliac revascularisation.

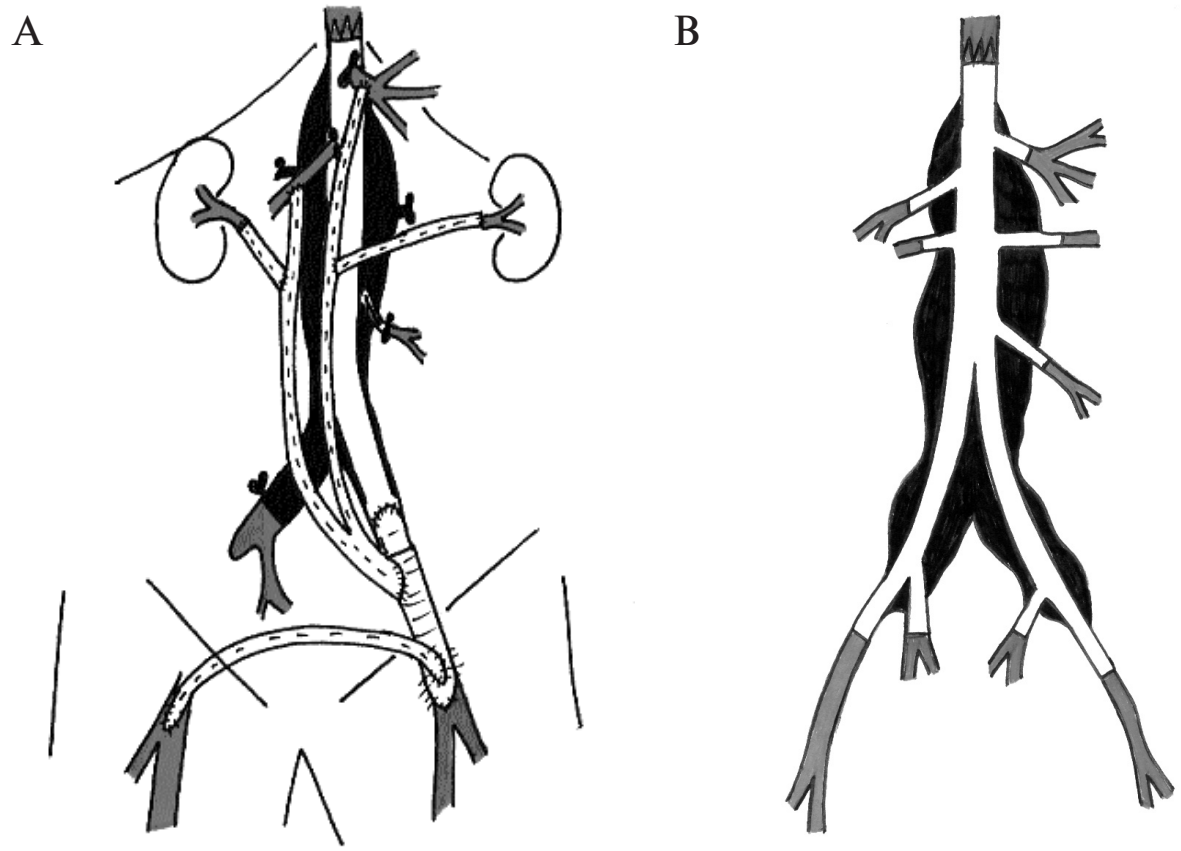

Fig. 4. Diagram of visceral aortic branches revascularisation – the AAA with visceral aortic branches arising from its sac.
A: Surgical revascularisation (iliac- renal, superiormesenteric and coeliac artery bypass) in case of AAA exclusion using classical stentgraft
B: Endovascular revascularisation using special branched stentgraft

mesenteric, iliac-trunk bypasses (Fig. 4 A)[1,4]. The basis for the common revascularization of all branches is a reversed ePTFE bifurcated prosthesis anastomosed to the external iliac artery, with the prosthesis limbs serving for the anastomoses of other branch origins. The combined strategy for the treatment of AAA taking the entire abdominal aorta with the origins of all the visceral branches is not only a display of technical virtuosity ("everything is possible"). For these patients, and not only the high operating risk ones, it is the only treatment option with a good prospect, and if properly indicated and carried out by an experienced vascular surgeon, it is successful. An entirely endovascular alternative to the repair of such AAA, the branched stentgraft, is still in the stage of a clinical experiment (Fig. 4 B)[30].

Combined strategy procedures creation

The procedures are carried out under the usual conditions for vascular surgery in the vascular surgical operating theatre. Access for the combined procedures is selected based on the type of the vascular surgical procedure with the miniinvasiveness taken into consideration. The extraperitoneal access or the transperitoneal mini-access are preferred. In some procedures, laparoscopic access may be used as an alternative, which, however, although being miniinvasive, is not without certain hemodynamic stress[31]. The choice of the type of anaesthesia corresponds with the type of procedure. Most procedures can be performed with regional (spinal, epidural) anaesthesia, general anaesthesia is chosen in the case of large vascular reconstructions from laparotomy. For the creation of a temporary alternative access, the dacron prosthesis of an adequate diameter is used, and ePTFE prostheses are used for the implantation of the revascularisation bypasses, the basis is a bifurcated one of 14/7 diameter. Multiorgan protection and promotion is used in the case of their revascularisation[3-5].

PATIENTS

From April 1996 to September 2002 we treated endovascularly 128 patients with asymptomatic AAA[32]. There were 25 (20 %) surgically unfit patients (ASA III, IV) with AAA of less suitable morphology for EVAR treated by combined strategy. We began with these "extended indications" from the year 2000. From the 68 patients treated over the last two years the combined strategy was used on 37 %. Alernative access was used in 10 patients, primary aortic banding was indicated in 4 patients, iliac-renal bypasses were created in 2 patients. Multiple

visceral branches revascularisation had to be created in 3 patients and femoral-internaliliac bypass in 6 patients.

There were no severe technical problems during the procedures and technical success was achieved in all the groups of patients. No serious general or local complications have occured in relation to higher invasiveness [1-5].

DISCUSSION, CONCLUSION

Combined strategy – the primary association of conventional open vascular surgery and EVAR – represents the main contribution of classical vascular surgery to endovascular treatment of AAA. Vascular surgeons need not participate in the vascular approach preparation and in the case of complications secondarily only.

What are the basics?

The endovascular/surgical procedure combination uses the advantages of both methods and eliminates the disadvantages.

The technical possibilities of classical vascular surgery make hemodynamicaly less loading no aorta clamping endovascular aneurysms sac exclusion possible and mitigate the risk of primary and secondary EVAR failure.

What are the benefits?

CS extends the possibilities of EVAR even to AAAs, which are less suitable or unsuitable for EVAR according to the current morphological criteria (given by the current stage of development of the stentgraft systems), thus extending the general possibilities of AAA treatment.

What are the negatives?

Increased invasiveness with all the consequences associated with additional open surgery.

Higher danger should be “no critical” indication of even more complicated “all” patients.

Thus, the CS clearly represents the current trend of treatment of AAA with a complicated morphology in high risk patients.

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