PREVENTIVE SURGERY FOR HEMODIALYSIS VASCULAR ACCESS SAVING

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BACKGROUND

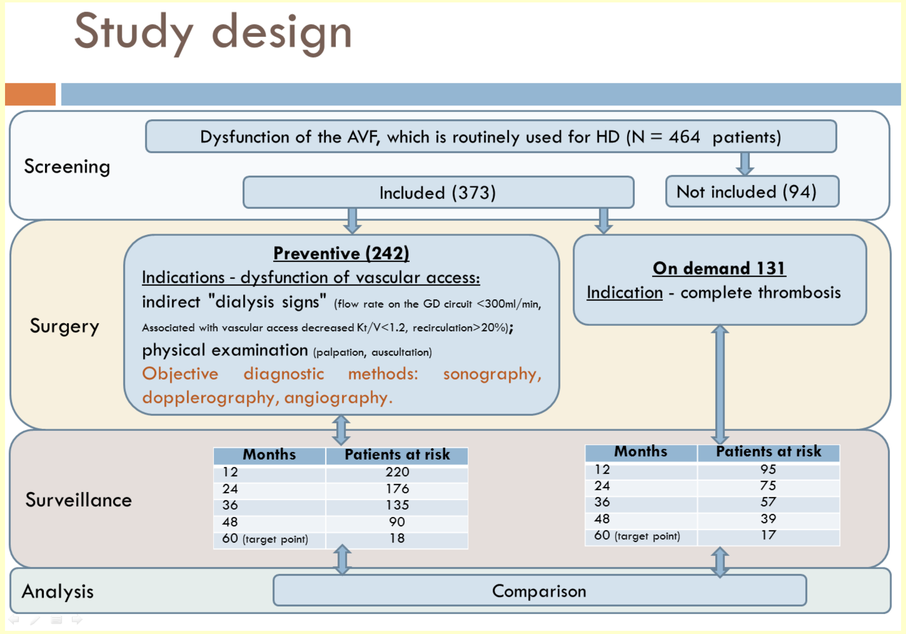
AVF requires not only a proper creation, but also supervision and maintenance. Complex of the regular monitoring and preventive and surgical interventions can significantly improve the treatment outcomes.

OBJECTIVES

To perform the comparative evaluation of the results of preventive surgery of the HD vascular access and surgery "on demand"

METHODS

Study design



We performed various types of surgical interventions. The simplest operations included typical proximalization of the arteriovenous anastomosis (fig. 1). In the main group the indication for surgery was distal stenosis of the fistula vein or arteriovenous anastomosis, and subtotal thrombosed aneurisms of the distal veins. The indications for the comparison group were total thrombosis of the anastomosis or of the distal vein.

In proximal stenosis or subtotal thrombosis of aneurisms we formed a proximal venovenous anastomosis and partial drainage into the system of the main vein basilica (fig. 2). If complete reversal of the blood flow was required, transposition of the vein basilica was performed (fig. 3). An important condition for these operations was salvage of the proximal part of the cephalic vein, available for punture.

A hidden reason for thrombosis of the fistula vein is often central venous stenosis, which is not accessible for open surgery via peripheral access. In such cases, we combined thrombectomy or proximalization of the arteriovenous anastomosis with endovascular balloon angioplasty of the central vein.

An important problem is the aneurismal transformation of the fistula vein. We performed an sparing aneurysmorrhaphy (fig. 4), which was supplemented by thrombectomy in the comparison group. In the case of prolonged subtotal aneurism thrombosis, it was resected with proximalization of the arteriovenous anastomosis (fig. 5). In rare cases, when there was no other way out, the aneurism was resected and the vascular access devise removed on the ipsilateral arm.

Most commonly, aneurisms develop alongside other pathologies of the fistula vein. In such cases, we tried to use the maximum amount of operative intervention for the optimal correction of the vascular access dysfunction. In small-size aneurisms and with proximal or distal stenosis of the fistula vein we performed a single stage economical aneurysmorrhaphy with plastics of the stenosis using autogenous tissue from the aneurism wall (fig. 6).

When extensive stenosis was present - expanded aneurysmorrhaphy was performed with compulsory transposition of the fistula vein for its optimal positioning with the aim of preventing it from entering below the stitches on the skin (fig. 7). A venovenous anastomosis was formed with the proximal part of the vein, alternatively proximalization of the arteriovenous anastomosis was performed. In the presence of cervical stenosis aneurysmoplasty was performed using autogenous tissue from the wall of the aneurism. For extensive stenosis or subtotal thrombosis of the proximal part of the vein, partial drainage or total reversal of blood flow from the reconstructed cephalic vein into the system of basilica vein.

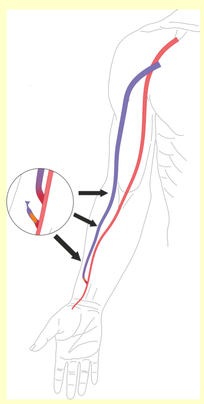


Figure 1. Proximalization of the A-V anastomosis

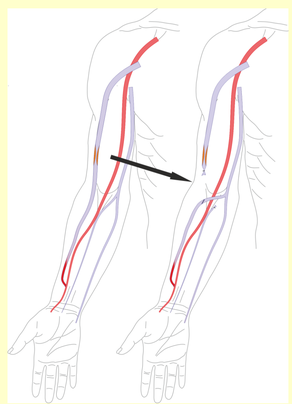


Figure 2. Partial drainage into the *v. Basilica*

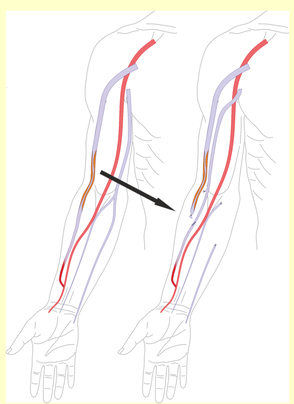


Figure 3. Switching blood flow into the *v. Basilica* with its transposition

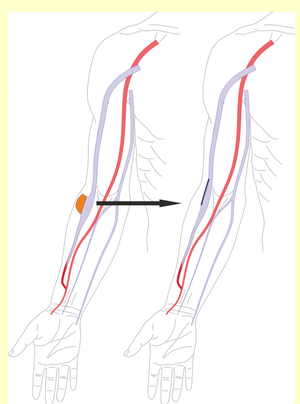


Figure 4. Sparing aneurysmorrhaphy

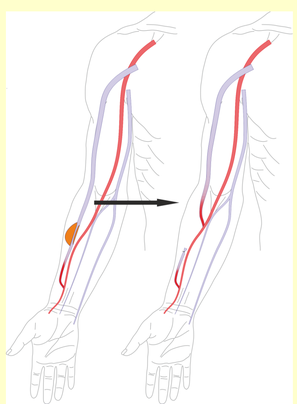


Figure 5. Aneurysm resection with proximalization of the A-V anastomosis

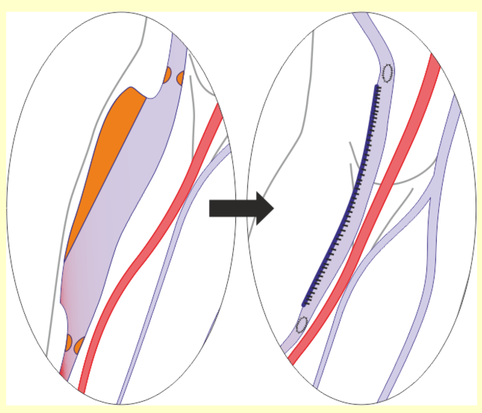


Figure 6. Sparing aneurysmorrhaphy with the plastic of the Para-aneurysmal stenosis

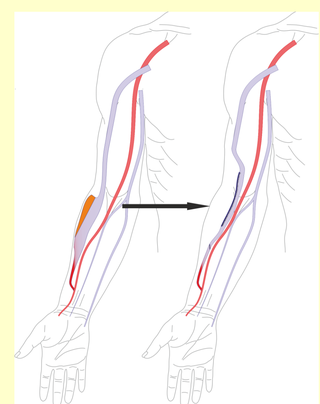


Figure 7. Expanded aneurysmorphia with transposition of the *v. Cephalica*

RESULTS

One of our aims was to reduce the need for using central venous catheters. Preventative surgery of the vascular access allowed to significantly reduce the need for implantation of a central venous catheter immediately post-operatively – nearly by half (fig. 8). At the same time, there was no difference in the risk of catheter associated infective complications between the two groups (catheter-associated infections risk ratio in control vs. study group = 1.27 [0.67; 2.41], $\chi 2$ p=0.555), and the total time for catheterisation of the central vein was somewhat less in the main group (fig. 9). In patients of the main group was observed lower proportion of dialysis with kT/V less than 1.2 in the timeframe analysed -(>=1.2 vs. <1.2: $\chi 2$ p<0.0001) (fig. 10).

In the figure 11 graph shows the actuarial survival rate of the vascular access: differences were statistically significant both in the early and late stages of the study. Reconstruction after total thrombosis of the AV fistula increases the risk of vascular access loss more than two-fold. At the same time, it is noteworthy that after 4 years of following these patients, the incidence rate of vascular access loss significantly increased in both groups.

Even in patients, who eventually lost the vascular access it was possible to prolong its function with preventative operative procedures (fig. 12).

There are was no significant difference in patient's survival (fig. 13).

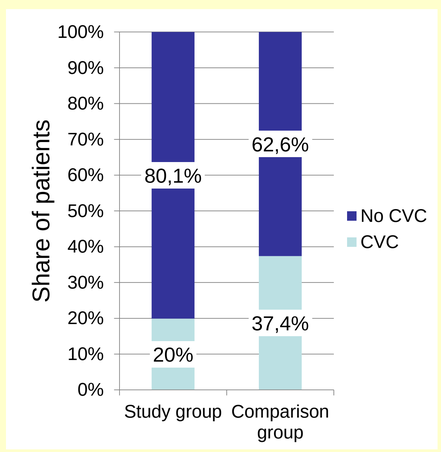


Figure 8. The proportion of patients with CVC. (Risk ratio (control vs. study group) 1.88 [1.33; 2.63], χ^2 p=0.001)

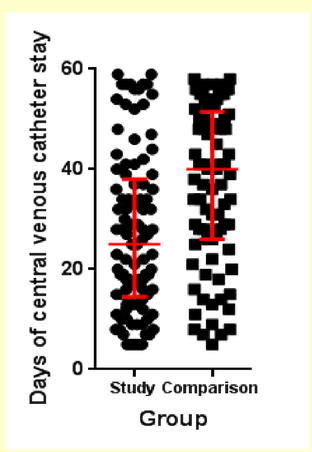


Figure 9. Duration of stay of the CVC. (Median and interquartile range. Mann Whitney p<0.0001)

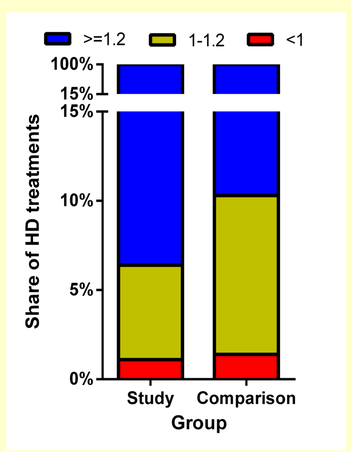


Figure 10. Share of HD treatments with kT/V >1.2; 1-1.2; <1

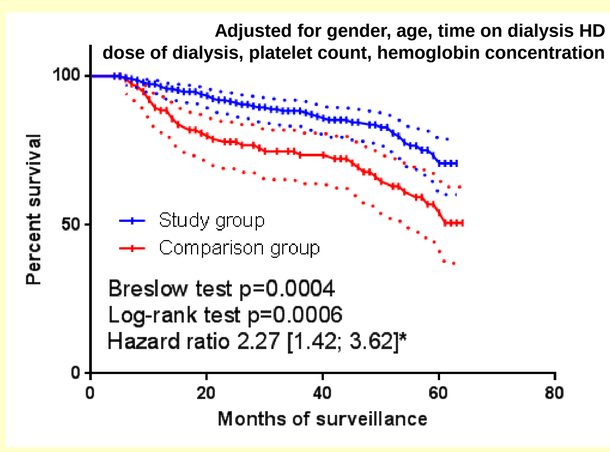


Figure 11. Secondary patency of the vascular access/

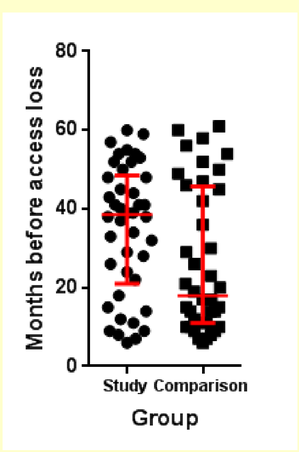


Figure 12. Time before access loss Duration of stay of the CVC. (Median and interquartile range. Mann Whitney p=0.028)

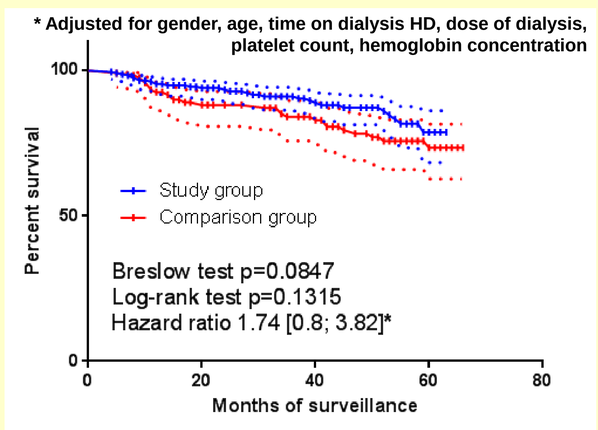


Figure 13. Survival rates of the patients.

Reasons for early loss of the vascular access in the comparison group:

- Profound changes to extensive parts of the fistula vein, which without timely correction may lead to the formation of heavy robust, morphological changes of the wall and to progressive thrombosis;
- High frequency of extensive phlebitis with the background of total and subtotal thrombosis;
- Organisational difficulties related to the servicing of high technology diagnostics and operations (dependent on whether an experienced doctor or specialists in ultrasound diagnostics and angiography are available 24/7?);
- Reduced frequency of combined surgical interventions, which provide optimal correction of vascular access dysfunction.
- With the combined effect of these factors it is impossible to gain primary and secondary patency of the AV fistula.

CONCLUSIONS

Reconstruction of AVF after thrombosis it is an unacceptable luxury. Preventive surgical interventions can significantly prolong the of AVF functioning period and reduce the risk of AVF total failure, improve HD effectiveness and patient outcomes.

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Dialysis - Vascular access I
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DOI: 10.3252/pso.eu.54ERA.2017
ePosters supported by F. Hoffmann- La Roche Ltd.
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