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Orthotopic kidney transplantation is a possible solution in difficult situations

D.V. Perlin✉[1,2], A.V. Terentyev[1,2], T.S. Vasiliev[1], Y.N. Dankov[1]

[1]Volgograd Regional Uronephrological Center,

86 General Karbyshev St., Volzhsky, Volgograd region 404120 Russia;

[2]Volgograd State Medical University,

1 Fallen Fighters Sq., Volgograd 400066 Russia

✉Corresponding author: Dmitriy V. Perlin, Prof., Dr. Sci. (Med.), Chief Physician of the Volgograd Regional Uronephrological Center; Head of the Department of Urology, Volgograd State Medical University, dvperlin@mail.ru

Abstract

Background. *Kidney transplantation is the most preferable definitive treatment for the end-stage renal disease. Often, patients who need organ transplantation have peculiar anatomical features that require a non-standard approach to performing this surgery.*

Objective. *To present a clinical case of orthotopic kidney transplantation in a patient with occlusive thrombosis of the external iliac veins.*

Material and methods. *A 31-year-old patient with stage 5 chronic kidney disease and occlusive thrombosis of the external iliac veins being prepared for a related donor kidney transplantation.*

Results. *Orthotopic kidney transplantation was performed. In order to ensure a sufficient length of the donor kidney artery and the convenience of its anastomosis, a segment of the recipient's splenic artery was used. The venous and ureteral segments of the graft were anastomosed end-to-end with the recipient's renal vein and ureter, respectively. After the surgery completion, the graft function was immediate. In the*

postoperative period, three-component immunosuppressive therapy was used. At the time of discharge, plasma creatinine was 0.15 mmol/L.

Conclusion. *Orthotopic kidney transplantation should be considered as an alternative solution in case of obliteration, thrombosis or atherosclerotic lesion of the recipient's iliac vessels. The method can be used in recipients with two or more previous transplants.*

Keywords: orthotopic kidney transplantation, repeated kidney transplantation, stage 5 chronic kidney disease

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Introduction

Kidney transplantation is currently a generally accepted method of choice for patients with end-stage chronic renal disease. The kidney transplantation technique is currently well-established and is a standard operation with a relatively low incidence of surgical complications. If the transplantation is performed for the second time, then the contralateral iliac fossa is used in the vast majority of cases.

A peculiar situation arises when performing a second, especially a third or fourth transplant surgery. In such circumstances, it is necessary to take into account the marked retroperitoneal fibrosis associated with the previous operations, which makes it difficult to isolate the vessels.

It is more difficult when it happens to patients with severe iliac artery sclerosis or iliac vein thrombosis (obliteration). There are no standard solutions for such situations. In such cases, an orthotopic kidney transplant may be a possible alternative [1].

Material and methods

We present a Case Report of orthotopic kidney transplantation performed on a 31-year-old patient with stage 5 chronic kidney disease. Over the previous two years, he had been receiving renal replacement therapy with hemodialysis via various vascular accesses (permanent venous catheters) due to repeated unsuccessful attempts to form arteriovenous fistulas.

A kidney transplant from a deceased donor was performed for urgent indications; however, due to venous thrombosis, the transplanted graft was removed in the immediate postoperative period. Several months later, the patient was admitted at the clinic again for a repeat, living related donor kidney transplant. The donor was the patient's 57-year-old mother. According to dynamic nephroscintigraphy, the left and right contributions were distributed in a ratio of 40% to 60% (Fig. 1). At computed tomography (CT), two renal veins were visualized on the right.

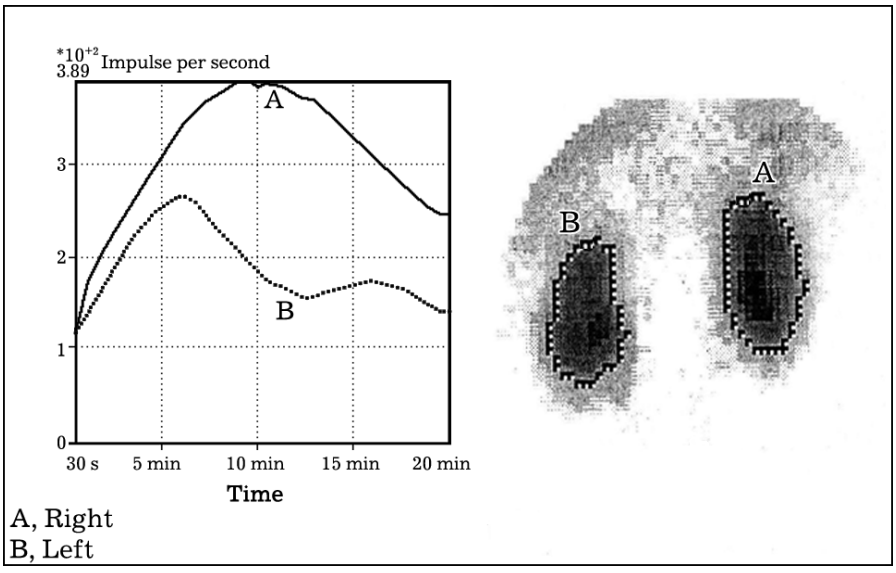

Fig. 1. Dynamic nephroscintigraphy in a kidney donor

Based on the obtained data, the left kidney was chosen as the priority for transplantation, as having less functional capacity and, in addition, the most favorable vascular characteristics.

As for the recipient, the angiography and ultrasonography examinations confirmed bilateral occlusive thrombosis of the external iliac veins (Fig. 2), which made it impossible to perform kidney transplantation into the iliac region.

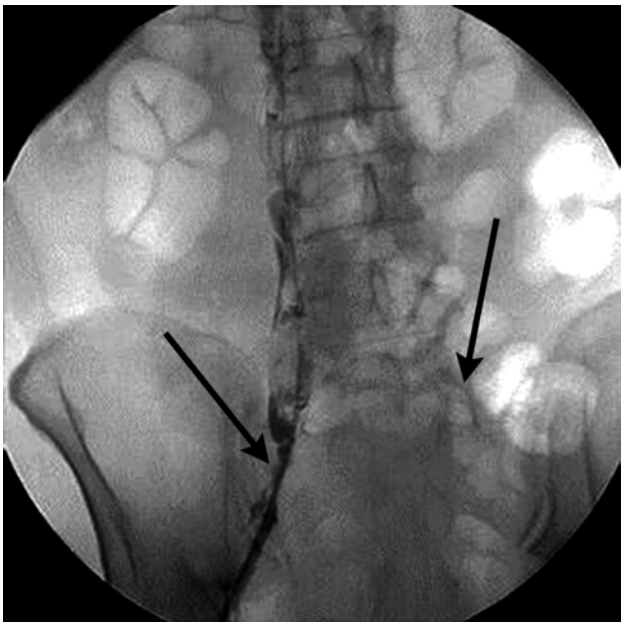

Fig. 2. Radiograph of the recipient's pelvic region at direct venography: Severe obstruction of the iliac veins (indicated by arrows)

Technique description of the performed orthotopic kidney transplantation

The first stage involved nephrectomy of the recipient's left kidney for subsequent transplantation of the kidney in the orthotopic position.

Access to the kidney was obtained in the 11^{th} intercostal space. The key points included the careful isolation of the vessels of the recipient's secondarily shrunken left kidney and determination of their suitability for

graft revascularization. Due to the insufficient diameter of the renal artery, the latter was ligated. Then the renal pelvis and proximal segment of the ureter were isolated (Fig. 3). And before removing the kidney, the splenic artery was mobilized (Fig. 4).

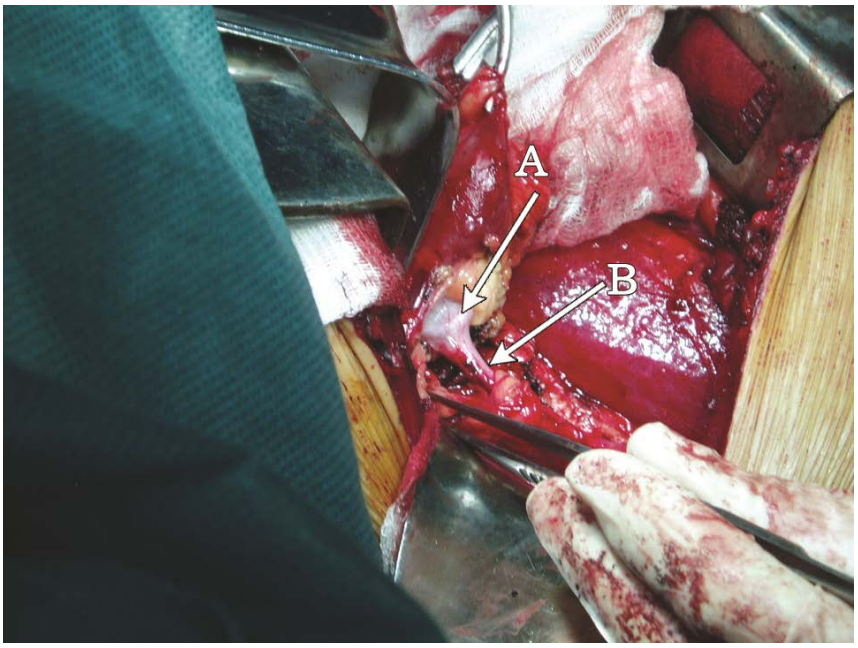

Fig. 3. Intraoperative photograph: Isolation of the renal pelvis and the proximal part of recipient's ureter. A, renal pelvis; B, ureter

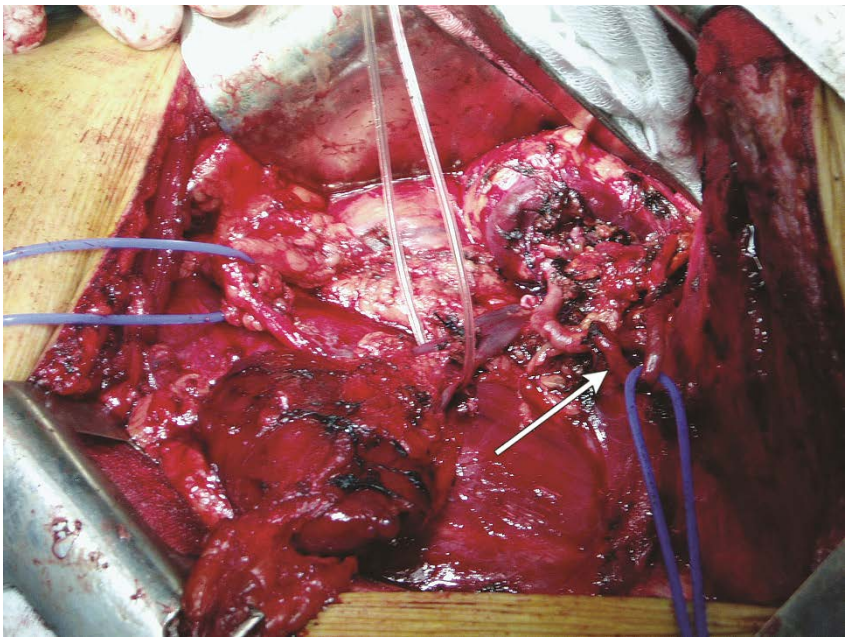

Fig. 4. Intraoperative photograph: Mobilization of recipient's splenic artery (indicated by the arrow)

At the same time, in another operating room, a donor nephrectomy was performed and the graft was managed on the back table. The donor kidney had two segmental arteries anastomosed at a common site. Once the donor organ was prepared, it was delivered to the operating room for subsequent transplantation to the recipient.

While preparing the artery supplying the donor kidney, the splenectomy was performed; the distal end of the recipient's splenic artery was ligated. The proximal end was anastomosed "end-to-end" to the graft renal artery (Fig. 5). Only after that was the vein of the recipient's shrunken kidney transected. An "end-to-end" anastomosis was made between the recipient's left renal vein, being long enough to form the anastomosis, and the vein of the graft (Fig. 6).

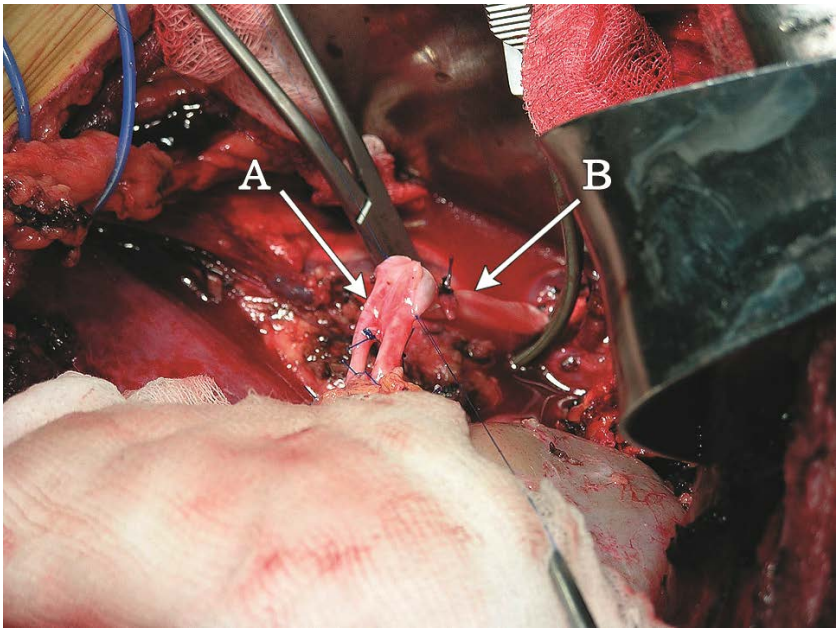

Fig. 5. Intraoperative photograph: Making the end-to-end anastomosis of the donor renal artery with the splenic artery.
A, renal artery; B, splenic artery

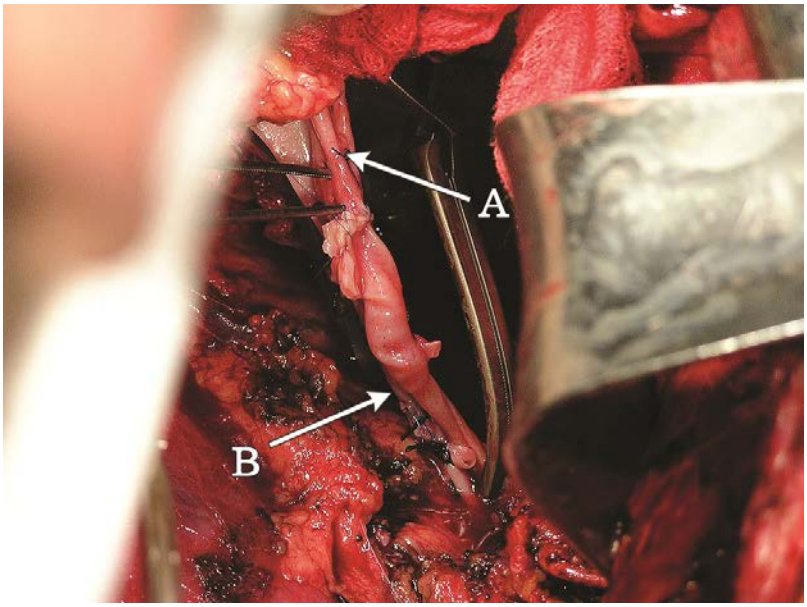

Fig. 6. Intraoperative photograph: Making the end-to-end venous anastomosis. A, donor kidney vein; B, recipient's vein

The recipient's ureter was transected and then stented with an internal double J stent. The shrunken kidney was removed. The "end to end" anastomosis was also formed between the renal pelvis of the graft and the recipient's own ureter (Fig. 7). As a result, the graft was located in an orthotopic position (Fig. 8).

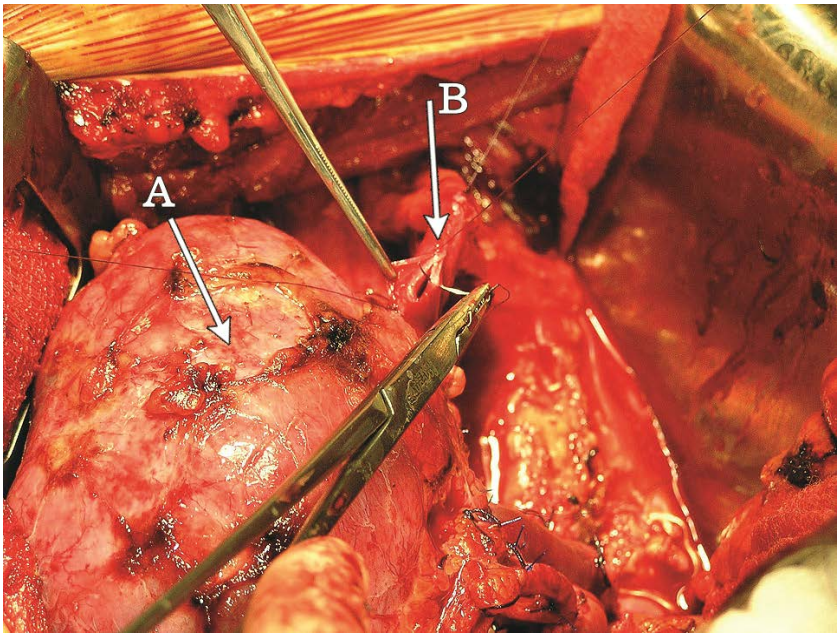

Fig. 7. Intraoperative photograph: Making the pyeloureteral anastomosis. A, donor kidney; B, ureter

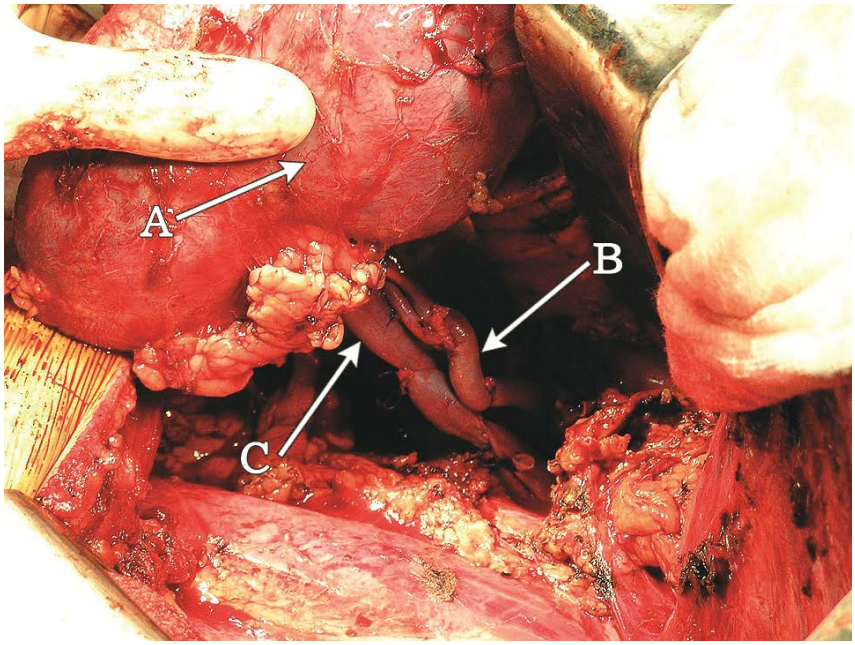

Fig. 8. Intraoperative photograph: Orthotopic position of the graft: The donor left kidney is in the recipient's left lumbar region. A, donor kidney; B, artery; C, vein

Results

Both surgeries: donor nephrectomy and kidney transplantation were performed without intraoperative complications. The volume of surgical blood loss was 100 ml and 250 ml, respectively. The immediate postoperative period for the donor and recipient was uneventful. The donor was discharged from the hospital on the 9th postoperative day. Plasma creatinine at discharge was 0.10 mmol/L.

The recipient had an immediate graft function. In the immediate postoperative period, the patient received a three-component initial immunosuppressive therapy with cyclosporine 5 mg/kg/day with subsequent maintenance of the blood level of the drug in the range of 200-230 ng/mL (C_0), mycophenolic acid 1440 mg/day (in two doses of 720 mg each), prednisolone 30 mg/day with dose decreasing to 15 mg/day over a month. Plasma creatinine at discharge was 0.15 mmol/L.

Discussion

Since the first successful kidney transplant performed by Joseph Murray in 1954, doctors have searched for a method that would provide the most favorable results. Their efforts resulted in the development of many different methods to perform the surgery, which have changed over time, supplemented, and replaced each other [2–6].

At the rise of transplantology, the preference was given to orthotopic kidney transplantation [1]. Over time, the technique have evolutionized both in terms of forming vascular anastomoses and in methods of restoring the passage of urine via the urinary tract. For venous anastomosis, the following could be used: the recipient's renal vein [7–9], which, unlike the renal artery, usually had sufficient lumen; the subhepatic segment of the inferior vena cava [7, 10, 11]; the inferior mesenteric vein [12, 13], the superior mesenteric vein, and even the portal vein [14]. The arterial anastomosis was formed directly with the aorta, sometimes with the stump of the renal artery if it had sufficient diameter and length [15–17].

Gradually, the number of orthotopic transplants decreased due to significant technical complexity and high incidence of surgical complications. Over time, the approach of kidney transplantation into the iliac region has come to the forefront, and yielded good postoperative results as was associated with less technical complexity.

Although in this case, it is also worth considering the possibly developing ischemia of the limb muscles or pelvic organs depending on the use of the external or internal iliac artery. And when using both internal iliac arteries for transplant revascularization, the development of erectile dysfunction and "dry" ejaculation in men, as well as ischemic pain in the gluteal muscles while walking, has been reported [18]. Some surgeons used, mainly in children, the gonadal vein for graft

revascularization in case of thrombosis and obliteration of the external iliac and even the inferior vena cava [19, 20]. In such cases, with an end-to-side anastomosing the renal vein to the gonadal vein, there was no venous hypertension of the graft [21]. This method is also convenient because the gonadal vein passes in close proximity to the iliac vessels and is quite mobile. This prevented tension even on the short renal vein.

There have been described case reports where, after a detailed study of the altered blood flow as a result of thrombosis of the iliac veins, one of the dilated presacral collaterals was used for venous outflow from the graft [22].

As for the performance of orthotopic kidney transplantation, the University of Barcelona Clinic has accumulated perhaps the largest experience in the world with such operations. In comparing the results of more than 200 orthotopic kidney transplants and more than 2,000 traditional heterotopic ones, J.M. Gil-Vernet et al. did not find significant differences in the patient and graft transplant survival rates over a follow-up period of up to 20 years [23].

In our clinic, orthotopic kidney transplantation from a living related donor have been performed twice. In the presented clinical case, we had to resort to this method of surgery due to bilateral extended thrombosis of the iliac veins in the recipient. The splenic artery was used for revascularization of the graft. This stage of surgery required splenectomy. The underlying technique had been proposed back in 1978 at the Barcelona University Clinic by J.M. Gil-Vernet et al. [24–25].

Conclusion

The use of the described surgical method in our practice has shown that short-term and long-term postoperative results are comparable with those in the case of kidney transplantation into the iliac region, which

suggests the possibility of using orthotopic kidney transplantation as an alternative to organ transplantation in cases of obliteration, thrombosis or severe atherosclerotic lesions of the iliac vessels. Despite a number of positive aspects, there are also potential negative consequences that should be taken into account in the preoperative period. Among them, there is the need for splenectomy in the recipient, the risk of splenic artery thrombosis with subsequently impaired blood flow in the pancreas, possible difficulties in performing a puncture biopsy, if necessary, due to a slightly different location of the kidney. The decision to perform orthotopic kidney transplantation should be balanced and justified in order to ensure the best results for the recipient.

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Information about the authors

Dmitriy V. Perlin, Prof., Dr. Sci. (Med.), Chief Physician of the Volgograd Regional Uronephrological Center; Head of the Department of Urology, Volgograd State Medical University, https://orcid.org/0000-0002-4415-0903, dvperlin@mail.ru

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Alexey V. Terentyev, Urologist, Department of Urology, Volgograd Regional Uronephrological Center; Associate of the Department of Urology, Volgograd State Medical University, https://orcid.org/0000-0002-4415-0903, terentyevalex1988@gmail.com

20%, literature review, text editing

Timur S. Vasiliev, Urologist, Dialysis Department, Volgograd Regional Uronephrological Center, https://orcid.org/0009-0002-1969-798X, timur-vasilev1@yandex.ru

15%, writing the text of the article

Yaroslav N. Dankov, Urologist, Department of Urology, Volgograd Regional Uronephrological Center, https://orcid.org/0009-0008-6873-2511, yaroslav.danckoww@gmail.com

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