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Preliminary experience with the use of an autologous platelet-rich fibrin membrane for urethroplasty coverage in distal hypospadias surgery

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Abstract *Objective:* Platelet-rich fibrin (PRF) has been shown to have structural and biological properties that promote tissue healing. This prospective study evaluated the feasibility, safety, and efficiency of using autologous PRF membrane for urethroplasty coverage in distal hypospadias.

Materials and methods: We prospectively included 33 patients with distal hypospadias operated on between June 2010 and September 2011. Urethroplasties were performed using the Duplay technique. During surgery, 5–10 ml of patient's blood was collected and immediately centrifuged. A PRF clot was transformed into a dense fibrin membrane with a particular cell content and architecture. This membrane was applied and sutured over the urethroplasty. The perioperative course and complications were recorded. Outcomes were compared with those in a control group of children undergoing the same procedure, but with another mean of coverage.

Results: With a median follow-up of 8 months (range, 6–18 months), urethral fistula occurred in 2/33 patients. No other complication was noted. No complication related to the blood sampling was reported. There was no statistically significant difference with the control group ($p = 0.65$).

Conclusion: The PRF patch seems to be a safe and efficient covering technique. Thus, procedure is an additional approach to coverage for hypospadias surgery, and may help to reduce the incidence of postoperative complications when coverage healthy tissue is not available.

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Introduction

Hypospadias is the most common congenital penile malformation, occurring with an incidence of 1 in 200–300 male births [1]. Urethrocutaneous fistula is a frequent postoperative complication of hypospadias surgery [2]. The frequency of complications, especially fistulas, is linked to the severity of the hypospadias [3]. This could be correlated with an impairment of the local healing process [4]. The use of fibrin glue as an additional layer over the urethroplasty has been recently described and is associated with a significant decrease in the fistula rate [5–7].

Dohan et al. developed the use of platelet-rich fibrin (PRF) [8]. PRF is a fibrin matrix polymerized in a tetramolecular structure containing a large quantity of platelets, cytokines, and leukocytes [9,10]. It is an immune and platelet concentrate on a single fibrin membrane, including diverse blood constituents favorable to healing and immunity. It has been used successfully in oral, maxillofacial, and plastic surgery to accelerate tissue healing [11,12]. The use of PRF in urethrocutaneous fistula repair has been reported recently [13].

We hypothesized that this type of autologous fibrin membrane, easily obtained intra-operatively, may be used to provide an interposition layer during hypospadias repair. Our study aimed to evaluate the feasibility of using PRF for urethroplasty coverage with the goal of preventing fistula formation in distal hypospadias.

Patients and methods

After obtaining approval from the institutional ethics committee, we prospectively included patients with distal hypospadias operated on by two senior pediatric urologist consultants (OA and BF) from June 2010 to September 2011. Informed consent was obtained from the parents. Patients with a follow up of <6 months were excluded. Patients with forms other than distal hypospadias (e.g., proximal hypospadias, urethrocutaneous fistula) were excluded. Pre-operative full-blood counts were obtained and hemostasis testing performed.

Hypospadias repair was performed by the Thiersch-Duplay procedure with the addition of the incised-plate artifice described by Snodgrass ($n = 27$) [14]. Tubularization was performed on an 8-Fr tube, with a first layer of interrupted polyglyconate 7/0, covered by a second layer of interrupted whenever possible. Three boys presenting with persistent penile curvature after complete degloving required dorsal midline plication.

A single dose of amoxicillin combined with clavulanic acid was administered during surgery.

A 5–10-ml blood sample was obtained intra-operatively, according to the patient's weight and the size of the patch needed. The anesthetist collected the blood, in most cases from the external jugular vein ($n = 23$), the femoral vein ($n = 6$), or a distal vein ($n = 4$). Ultrasonography was routinely used for the guidance of vein puncture. Blood was collected into a sterile plain glass tube (BD Vacutainer Z (Becton, Dickinson and Company, Franklin Lane, NJ, USA), reference 368430) and immediately centrifuged at 3000 rpm ($400 \times g$) for 10 min, before completion of the

urethroplasty. The success of this technique depended on the swiftness of blood collection and transfer to the centrifuge.

After centrifugation, a fibrin clot forms in the middle of the tube between the acellular plasma at the top and the red blood cells at the bottom (Fig. 1). The clot was extracted from the tube, separated from red blood cells, and gently compressed between two surgical swabs to give a soft and resistant membrane (Figs. 2–4) usually of approximately >10 mm long and <1 mm thick. The entire procedure was performed under strict aseptic conditions.

This autologous PRF membrane was applied over the urethroplasty and secured using a few resorbable polyglyconate 7/0 interrupted sutures, resulting in minimal additional operating time (Figs. 5 and 6). The skin was then sutured over the patch with foreskin reconstruction ($n = 17$) or circumcision ($n = 16$). No other coverage technique (e.g., spongioplasty, dartos, or foreskin subcutaneous flap) was used. A trans-urethral catheter was left in place with a compressive dressing in 14 cases for a mean of 3 days; for the other 19 patients, surgery was performed on an outpatient basis without urethral stent, as decided by the surgeon.

All patients were scheduled to be examined in the outpatient clinic 1 month and 6 months postoperatively, to assess the urethral meatus position, the presence of urethrocutaneous fistula, stenosis, and quality of tissue healing.

The control group included all boys with distal hypospadias of the same severity, undergoing initial surgery by

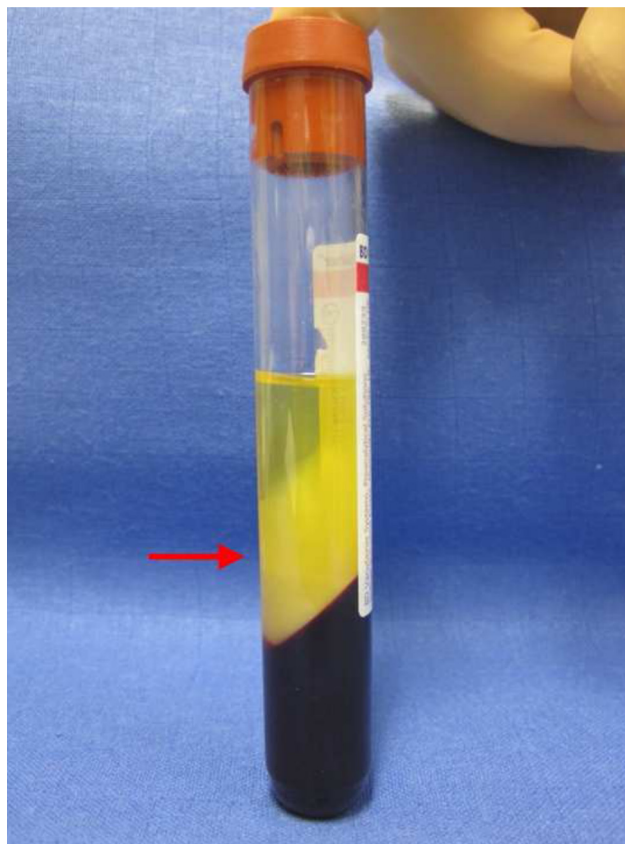


Figure 1 PRF clot in the middle of the tube after centrifugation.

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