

Meatal mobilization (MEMO) technique for distal hypospadias repair: Technique, results and long-term follow-up

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KEY WORDS

hypospadias ► meatal mobilization (MEMO) ► urethral reconstruction

ABSTRACT

Introduction. Several surgical approaches are currently in use for distal hypospadias. Herein, we present our technique of meatal mobilization (MEMO) and provide both early and long-term outcome data.

Patients and methods. We investigated 145 patients who underwent repair of distal hypospadias using the MEMO technique. Forty-six patients are short-term (Group A) with a mean follow-up of 28.5 months. Ninety-nine patients (Group B) were available for long-term follow-up (mean 85 months). After penile degloving, mobility of the meatus is evaluated and after urethral preparation the meatus is fixed to the tip of the glans. Glanuloplasty covers the neo-urethra providing a barrier layer. Shaft skin reconstruction completes the procedure. Patients were evaluated regarding operative time, peri- or postoperative complications, hospital stay as well as functional and cosmetic outcome.

Results. Mean duration of surgery was 73 minutes. There were no intraoperative complications. There was no repair breakdown, new-onset chordee, or meatal stenosis. Primary success rate was 97% in the short-term group. In one patient the meatus retracted but remained in the glans. No urethral fistula was seen. During long-term follow-up (group B) one urethral fistula and two meatal retractions occurred that required redo surgery. In one patient a mild ventral penile deviation without a need for correction was noted leaving a success rate of 96%.

Conclusions. The MEMO-technique is a valid and reliable method for the correction of distal hypospadias. Complications are minimal while the cosmetic results are excellent. Early success rates exceed 95%. The consistent long-term data prove the durability and effectiveness of this simplified technique.

INTRODUCTION

Distal Hypospadias accounts for 50-60% of all forms of hypospadias with an increasing incidence being present in 1 out of 125 male newborns [1]. Of those, 15% are glanular, 50% coronal, 30% subcoronal, and 5% are of the megameatus intact prepuce (MIP) variant.

A broad variety of surgical techniques are described and are currently in use. However, none is considered suitable to correct all distal hypospadias variants. The goal of every technique is to achieve a cosmetically normal, straight penis with a slit-like meatus at the tip of the glans in conjunction with a minimal complication rate and short hospital stay. Still, there is no final consensus on the ideal surgical approach. Most pediatric urologist favor tubularized plate urethroplasty (TIP) as described by Snodgrass. However, there is increasing controversy about urethral plate incision.

Generally, the surgical technique of choice is decided upon meatal location, the appearance of the meatus relative to the glans, the presence or absence of chordee, and the quality of the preputial hood. A technique for advancing the urethra was first described by Beck in 1898, leaving the meatus in a coronal position [2]. This original technique was subsequently modified by various authors [3-8]. Based on the procedure described by Beck, the meatal mobilization (MEMO) technique was developed to correct coronal and subcoronal hypospadias. This approach combines meatal mobilization by distal urethral dissection with steps of previously established techniques, e.g. a rotational flap for fashioning the Firlit preputial collar [8] and straight-forward glanuloplasty [1]. Herein, we present our experience with the MEMO technique describing both short-term and long-term outcome in a considerable cohort of patients.

PATIENTS AND METHODS

A total of 264 males who underwent MEMO were retrospectively identified. Of those, 46 patients aged from 1.5 to 14 years (mean: 3.8 years) were available for short-term follow-up (Group A). The meatus was located coronal in 28, subcoronal in 12, and glanular in 5 boys, respectively. One boy presented with a MIP variant. One hundred nine patients had surgery more than 5 years ago. However, only 99 patients (Group B) were available for follow-up (mean 85 months). Initial meatus position was coronal in 66, subcoronal in 25 and glanular in 8 boys, respectively. Mean age at the time of surgery was 4.3 years (1.3-15). All operations were done by a single surgeon (J.S.).

Technique: All operations were done according to reconstructive surgical principles using loupe magnification (2.5 x), fine suture material as well as micro instruments [1].

First, individual morphology of distal hypospadias is assessed, focusing on the dorsal preputial hood, the meatus, and

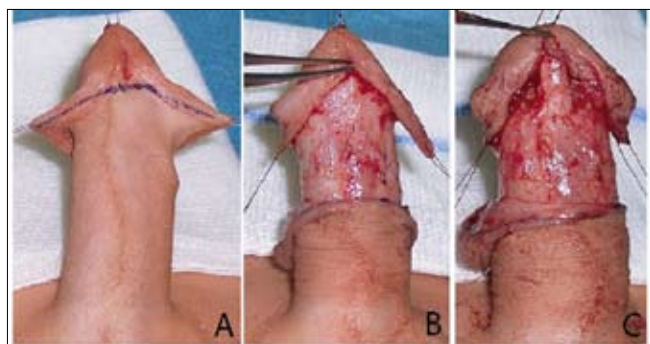


Fig. 1. A) coronal hypospadias with glanular groove, holding stitches in place, and marked incision line. B) degloving of penile skin. As the most important step for decision making the mobility of the ventral aspect of the urethra is assessed. C) dissection of the urethra is only necessary in the very distal part of the urethra in order to reach the tip of the glans.

the urethral plate. In addition to general anesthesia a local penile block is injected using weight-adapted bupivacaine 0.5%. Stay sutures at the glans and on both sides of the dorsal preputial hood facilitate intraoperative handling. With a marking pen the dorsal and ventral incision line is delineated (Fig. 1A). A 1:200 000 epinephrine solution is injected for local hemostasis further facilitating the dissection. An intra-urethral silicon stent is inserted and skin incision is performed. The initial dissection of the penile skin is started dorsally along Buck's fascia until the base of the penis is reached. The key step of the procedure is assessment of distal urethral mobility after penile skin dissection. Only with an appropriately mobile urethra the MEMO technique can be performed (Fig. 1B). Application of a tourniquet and artificial erection using saline demonstrates a straight penis without deviation. Urethral calibration using bougie-a-boule excludes stenosis. The meatus is incised circumferentially starting laterally on both sides of the meatus. The corporal bodies represent the dorsal plane of mobilization. Along this plane dissection is easy and is performed 1 to 1.5 cm proximally (Fig. 1C). The length of mobilization depends upon the mobility of the urethra, but dissection should not be done too far proximally avoiding curvature and fistula formation. Following mobilization the meatus is easily brought up to the tip of the glans. Incision of the glans up to the tip is followed by excision of excess mucosa on both sides. Dissection of glanular wings allows tension free rotation of glanular tissue to cover the underlying urethra (Fig. 2A). Using 7-0 vicryl interrupted sutures adaptation of glanular and urethral epithelium is performed. Following completion of the glanular reconstruction a ventral stay suture facilitates the placement of the last two ventral sutures for meatal adaptation. Glanuloplasty is accomplished with two or three 6-0 vicryl sutures. It brings spongy tissue ventrally covering the urethra while a conic glans is constructed. Meatus reconfiguration is completed with the last two sutures ventrally followed by adaptation of the glanular epithelium with 7-0 vicryl interrupted sutures (Fig. 2B). Excessive skin is removed and the inner prepuce is reconstructed. Urethral calibration with bougie-a-boule excludes iatrogenic stenosis. Penile skin is adapted to the inner prepuce using 6-0 vicryl interrupted sutures. For ventral skin deficiency of the penile shaft, parts of the dorsal skin can be rotated ventrally. Ventral lengthening prevents postoperative ventral deviation due to skin deficiency. If there is enough penile shaft skin, ventral lengthening is not necessary. Excessive dorsal preputial skin is removed. A 6 French silicone catheter is inserted and removed the following day and the patient discharged. A gauze dressing followed by a sterile compress is placed around

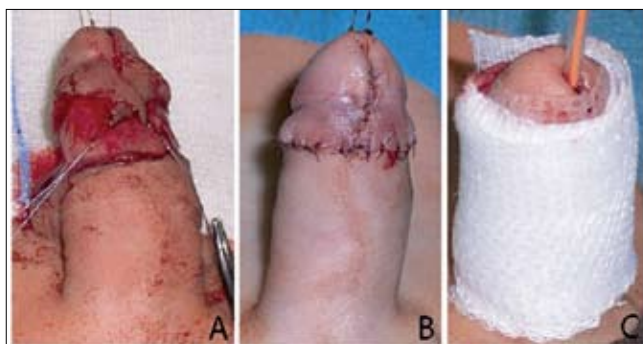


Fig. 2. A) after glanuloplasty ventral skin reconstruction of the inner prepuce is achieved by rotating the preputial flaps ventrally. B) final outcome at the end of the operation. C) gauze dressing and postoperative stenting.

the penis and remains in place overnight (Fig. 2C). See also the stepwise illustration in Figure 3.

Both groups were evaluated regarding operative time, intra- and postoperative complications, and length of hospital stay as well as regarding the overall success rate. Any postoperative instrumentation was considered a failure.

The follow-up scheme included a urinalysis, residual urine measured by ultrasound, and an objective hypospadias symptom score (HOSE) [10].

RESULTS

Mean operative time was 73 minutes (50–100 minutes). All corrections were performed in one session. Mean time of anesthesia was 85 minutes (70–115 minutes). After penile degloving there was no case of persistent ventral curvature. Hence, no penile straightening using dorsal plication was necessary. The indwelling silicone catheter was always removed on the first postoperative day. Mean duration of hospitalization was 2.3 days (1 to 4 days). Ninety-four percent of the patients were discharged on the first postoperative day. In group A the mean follow-up period was 28.5 months. All patients voided without residual urine. One patient had a minor complication, a local hematoma, which was treated conservatively. Another developed a meatal retraction, which remained in the glans penis and was rated a major complication. No *de novo* penile curvature was seen during the follow-up. The location of the meatus was at the tip of the glans in 44 patients (97%), with a slit-like configuration in 42 patients (93%). The others had an oval configuration. Hence, the overall success rate was 97% in group A.

In group B 109 patients had the operation longer than 5 years ago and 99 patients could be followed. The external genitalia of all 99 patients appeared age correlated as seen after circumcision. All patients reported about normal erections while 5 of them had sexual intercourse after puberty. In 96 patients the meatus was located at the tip of the glans. In 3 males the meatus was located ventral-glanular. In 97 patients the configuration of the meatus was slit-like and 2 were oval.

None of the 99 patients reported about urinary tract infections since hypospadias surgery. All urine samples demonstrated normal findings. All patients voided without residual urine as confirmed by ultrasound. None of them noted a split urinary stream. Using the HOSE score, 93 patients (94%) reached the maximum of 16 points (without any restriction). Six patients (6%) reached 12–15 points (minimal restrictions), of whom 3 had a glanular meatus; one had a mild ventral curvature (10°), which was noticed at the time of the MEMO procedure without the need of surgical correction, one had a urethral fistula and two an oval meatus. Two patients with a retracted meatus and the one with

a urethral fistula were revised. Overall surgical success rate in group B is therefore 96%.

DISCUSSION

The MEMO technique [1], based on a procedure first described by Beck [2], allows for correction of most coronal and subcoronal hypospadias without tubularizing the urethra or applying a flip-flap procedure. In 2004, Snodgrass [9] demonstrated a risk of urethral fistula formation of 4% and a risk of meatal stenosis of 6.7%. Excessive dorsal incision of the urethral plate in the TIP-procedure might cause fibrosis of the spongy tissue and subsequent stricture formation [9, 10]. However, the complication rate for distal hypospadias repair using the flip-flap procedure in regard to urethrocuteaneous fistula and proximal urethral stricture formation was higher than for the TIP-procedure [11].

In the presented study, 46 boys underwent surgery using the MEMO technique. No urethral stricture or urethrocuteaneous fistula formation was seen. Only one meatal retraction (3%) occurred in the short term. Hence, the MEMO technique was consistently applied in all consecutive patients as well as in one MIP (Megameatus intact prepuce) variant. The final decision if the MEMO technique is feasible can only be made after degloving of the penis. The ventral aspect of the urethra should not be too flimsy and the urethra should be mobile enough. Hence, an exclusion criterion to perform the MEMO technique is a densely fixed urethra. In such cases other alternative procedures such as the TIP-repair need to be employed. The mean duration of surgery (73 minutes) is similar to those reported in the literature. Creating a subcutaneous flap from the dorsal foreskin and rotating this flap ventrally for coverage of the urethra or even using a tunneled tunica vaginalis flap is time consuming and increases the morbidity [12]. Such additional steps are not necessary using the MEMO technique. The presented technique provides healthy spongy glans tissue with an inherent blood supply. Rotating it ventrally adds an additional layer to cover the urethra preventing fistula formation. This maneuver additionally creates a cosmetically appealing conical shape of the glans. Incorporation of the Firlit collar technique and approximation of the inner prepuce ventrally further adds to the good cosmesis [8].

Urethral calibration after glanuloplasty with a bougie-a-boule helps to prevent iatrogenic urethral stricture. Parts of the excess dorsal preputial skin can be used for ventral penile shaft reconstruction, thus further reducing the risk of postoperative ventral deviation.

Unlike Beck, who simply closed the penile skin ventrally and left the flattened glans untouched, other authors tunneled the glans, with a high risk of stenosis [2, 6, 7].

A silicone catheter can be removed on the first postoperative day because no ventral urethral suture line is performed. Spontaneous voiding after removal of the urethral catheter was possible in all of our patients. The MAGPI procedure being also an outpatient technique is not very widely used due to its relatively poor cosmetic results whereas the GRAP technique is not suitable whenever chordee is present [13]. The MEMO technique is applicable with or without the presence of chordee [13]. In the long-term follow-up out of 99 patients only one urethral fistula and two meatal retrac-

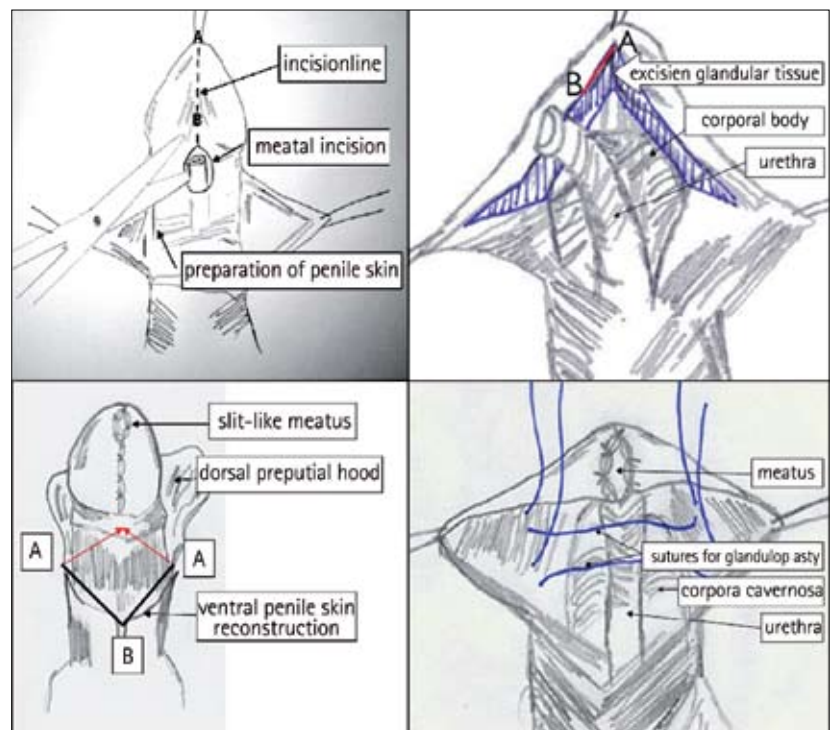


Fig. 3. Stepwise illustration of the MEMO-technique

tions (3%) needed redo surgery. Using the meatal mobilization after urethral preparation there is almost no risk for new-onset penile curvature or urethral structure.

CONCLUSION

The surgical technique of meatal mobilization (MEMO) may be used to correct almost all types of distal hypospadias, including the MIP-variant. The MEMO-technique is a well-standardized technique with a consistently high success rate. This is probably due to the following feature: no ventral urethral suture line is needed while healthy spongy tissue covers the urethra ventrally. In comparison with other surgical techniques for treating distal hypospadias, the described technique offers excellent postoperative outcomes, low intraoperative and postoperative complication rates, and a short hospitalization. Therefore, MEMO is our preferred technique to correct anterior hypospadias.

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