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Original Article

Evaluation of Factors Affecting Surgical Success in Megameatus Intact Prepuce Cases

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ABSTRACT

Aim: Megameatus intact prepuce (MIP) is a rare form of hypospadias. Different meatal/urethral advancement and urethroplasty techniques are used in the treatment of MIP. This study aimed to evaluate the success of various surgical methods for the treatment of MIP.

Materials and Methods: Patients who underwent circumcision, meatoplasty, and urethroplasty techniques due to MIP between 2011 and 2022 were included in this study. Surgical success was accepted as the absence of complications and/or the need for additional treatment. The statistical significance level was accepted as 0.05.

Results: This study included 100 patients with a median age of 33 months. Of these, 94 patients were admitted to our center with untreated MIP, 5 presented after circumcision and 1 after MIP repair in another center. The urethral stent placement rate was significantly lower in those patients with a glanular meatus location as in patients who underwent the meatoplasty technique ($p<0.001$). The complication rate was significantly higher in the Duplay with Posterior Meatal Incision (DPMI) technique when compared to the other techniques ($p=0.033$). There were no significant differences between the meatoplasty, Duplay urethroplasty, Pyramid urethroplasty, and DPMI techniques in terms of the need for additional surgical intervention ($p=0.102$). None of the five previously circumcised patients who underwent Duplay urethroplasty experienced any complications. When the complication rates were compared between the patient group presenting with untreated MIP and those who underwent Duplay urethroplasty, no statistically significant difference was detected ($p=0.534$).

Conclusion: According to the conclusions of this MIP series, prior circumcision or the preference for any specific surgical technique that preserves the urethral plate did not affect the success of MIP treatment.

Keywords: Megameatus intact prepuce, hypospadias, circumcision, meatoplasty, urethroplasty

Introduction

Megameatus intact prepuce (MIP) is a rare concealed form of hypospadias, accounting for 3-5.2% of all cases (1,2). MIP differs from other types of hypospadias due to its anatomy, which includes an intact prepuce, a lack of ventral chordee, and a wide urethral plate. The cause of MIP is believed to be developmental deficiencies in ventral spongiotic tissue in the glanular part of the urethra or possible ischemia secondary to the compression of the glanular urethra (3-5).

The anatomic appearance of MIP has a wide spectrum. Depending on how wide and deep the glanular groove expands, the meatus may extend to the coronal or subcoronal area. While the frenulum may develop normally in cases where the meatus is located in the glans, it may not develop at all when the meatus is located more proximally. Since preputium development is complete, patients are mostly diagnosed during circumcision or after the age of 4-5 years, when preputial retraction is easier.

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MIP surgery is performed for the purpose of a proper and straight projection of urine and a normal cosmetic appearance. The surgical repair technique is determined according to the penile anatomy (meatus location, presence of frenulum, structure of glanular collars) and the surgeon's preference. Meatal/urethral advancement techniques and urethroplasty techniques [Duplay, Glans Approximation Procedure (GAP), Pyramid, and Tubularized Incised Plate (TIP)] are the most commonly used methods in the treatment of MIP (1,6-8).

Although the studies in the literature for the treatment of MIP have a high success rate, to date, there has been no study with a large number of patients investigating the superiority of these methods. This study aimed to evaluate the success of various surgical methods for the treatment of MIP.

Materials and Methods

The hospital records of those patients treated for MIP between 2011 and 2022 were evaluated retrospectively. The treatment median ages of the MIP patients were compared with the median ages of other types of distal hypospadias during the same period. Patients aged 0-17 years with intact preputium and megameatus were included in this study, while those with missing records were excluded.

Demographics, meatus localization, whether it was a primary surgery, circumcision status, curvature, surgical details (the technique used, degloving, urethral stenting), complications, and the need for postoperative interventions were examined. Surgical success was accepted as the absence of complications and/or the need for additional treatment.

Approval for the conduct of this study was obtained from the Medical Research Ethics Committee of Ege University Faculty of Medicine (approval no.: 23-3T/14, date: 09.03.2023). Written informed consent was obtained from the parents.

Definitions Regarding Surgical Management

Circumcision only: For those cases where the glans wings were not widely separated, the frenulum developed normally, and with glanular megameatus, which would not cause voiding disorders or cosmetic problems, only circumcision was performed with the consent of the families.

Meatoplasty: A meatoplasty and glansplasty customized for each patient's specific anatomy were performed for those patients who did not need urethroplasty but required some cosmetic amendment.

Urethroplasty: Duplay and Pyramid techniques were mainly used in those cases requiring urethroplasty. Among the patients who underwent Duplay urethroplasty, a modification of vertically incising the mucosal fold was applied to a subgroup with a mucosal septum extending between the meatus and the mucosal pit to ensure smooth voiding. This technique is referred to as Duplay with Posterior Meatal Incision (DPMI) in this article.

Statistical Analysis

Surgical success and complication rates were evaluated according to the meatus localization and the surgical method applied. The compatibility of the data to the normal distribution was evaluated using the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare groups for numeric variables, and the chi-square test was used for categorical variables. SPSS version 23.0 (SPSS, Chicago, IL, USA) was used for statistical analysis. The statistical significance level was accepted as 0.05.

Results

There were 103 patients with MIP who were admitted to our department between 2011 and 2022, and of these, 100 were included in this study. Three patients who had previously undergone circumcision and did not require additional intervention were excluded from this study. The median age was 33 (12.9-88.8) months. The median age of 434 patients who were operated on for other types of distal hypospadias in our department during the same period was 19 (13-42) months. A statistically significant difference was found between the median treatment ages of both groups (p=0.008).

Among all, 26 (27.7%) patients with MIP were diagnosed during circumcision in our clinic, and 68 (72.3%) were referred from other centers with a diagnosis of MIP. Among those patients who were referred from different centers, 8 had undergone circumcision, and one had a failed repair before admission. No additional procedures were applied to 3 of the 8 patients who had been circumcised only, since they did not have any cosmetic or voiding problems. Duplay urethroplasty was applied to the other 5 patients and those with previous MIP repair. The surgical techniques applied to the 100 patients who were managed in our center are shown in Table I.

In our study, out of the 100 patients, 9 (9%) had mild curvature, which improved with degloving alone, and 2

(2%) had severe penile curvature (>30°) requiring additional penile plication. Among the 84 patients who underwent meatoplasty or urethroplasty, 65 received a urethral stent. Table II shows the frequency of urethral stent placement based on meatus location and the surgical technique applied. While the stent placement rates in those patients who underwent MIP repair were 100% in both the coronal and subcoronal meatus groups, this rate was 39.7% (23/58) in the glanular meatus group. The stent placement rates in the meatoplasty, Duplay urethroplasty, DPMI urethroplasty, and Pyramid urethroplasty groups were 21.7%, 97.3%, 100%, and 100%, respectively. Patients with a glanular meatus had significantly lower stent placement rates than those with meatus in other locations (p<0.001), as did those who underwent meatoplasty compared to other techniques (p<0.001).

The median postoperative follow-up time for all 100 patients was 6 (4-8) months. The complication rate in the 84 patients who underwent meatoplasty or urethroplasty was 8.3% (4 had fistula, and 3 had meatal stenosis). The three patients with meatal stenosis were successfully treated with topical betamethasone and dilatation, and no additional surgery was necessary. Five surgical interventions were performed among the four patients with fistulas (Table III). There were no significant differences between the meatoplasty, Duplay urethroplasty, Pyramid urethroplasty, and DPMI techniques in terms of the need for additional surgical intervention (p=0.102). No complications were observed in any patient who underwent meatoplasty or Pyramid urethroplasty. While the complication rate was 10.8% in those patients who underwent Duplay urethroplasty, it was 27.2% in those who underwent DPMI urethroplasty. The complication rate was significantly higher in those patients who underwent DPMI urethroplasty when compared to those who underwent the other procedures (meatoplasty, Duplay urethroplasty, Pyramid urethroplasty) (p=0.033). None of the five previously circumcised patients who underwent Duplay urethroplasty experienced any complications. No statistical difference was observed between the complication rates in those patients who presented with circumcised MIP (none of 5 patients) and those with uncircumcised MIP (4 out of 31 patients) who underwent Duplay urethroplasty (p=0.534).

Discussion

MIP, or megameatus intact prepuce, is a congenital abnormality that may lead to urinary problems and aesthetic dissatisfaction in boys. The severity of clinical symptoms

Table I. Distribution of surgical techniques by meatal localization

	Circumcision (n)	Meatoplasty (n)	Duplay urethroplasty (n)	DPMI urethroplasty (n)	Pyramid urethroplasty (n)
Glanular meatus (n=58)	16	23	11	2	6
Coronal meatus (n=25)	0	0	12	6	7
Subcoronal meatus (n=17)	0	0	14	3	0
Total number of patients (n=100)	16	23	37	11	13

DPMI: Duplay with posterior meatal incision, n: Number of patients

Table II. The frequency of urethral stent placement according to the meatus locations and the surgery techniques

	Meatoplasty n (%)	Duplay urethroplasty n (%)	DPMI urethroplasty n (%)	Pyramid urethroplasty n (%)	Total n (%)
Glanular meatus	5 (21.7)	10 (90.9)	2 (100)	6 (100)	23 (39.7)
Coronal meatus	0	12 (48)	6 (24)	7 (28)	25 (100)
Subcoronal meatus	0	14 (82.4)	3 (17.6)	0	17 (100)
Total number of patients	5 (21.7)	36 (97.3)	11 (100)	13 (100)	65 (65)

DPMI: Duplay with posterior meatal incision, n: Number of patients

Table III. Complications requiring additional treatment in patients operated for megameatus intact prepuce

	Meatal localization	Surgical technique	Complication	Additional treatment-1	Additional treatment-2
Patient 1	Subcoronal	Duplay	Meatal stenosis	Meatal dilatation + topical betamethasone	-
Patient 2	Subcoronal	Duplay	Fistula	Fistula repair	-
Patient 3	Glanular	DPMI	Meatal stenosis	Topical betamethasone	-
Patient 4	Coronal	Duplay	Meatal stenosis	Topical betamethasone	-
Patient 5	Glanular	Duplay	Fistula	Re-do repair	Fistula repair
Patient 6	Subcoronal	DPMI	Fistula	Fistula repair	-
Patient 7	Coronal	DPMI	Fistula	Fistula repair	-

DPMI: Duplay with posterior meatal incision

and the need for surgery depend on the configuration of the meatus and glans. In cases where the meatus is located on the glans and there is a frenulum, no extra intervention may be required other than circumcision, depending on family preference. However, other MIP cases may require meatoplasty or urethroplasty techniques, such as Duplay, Pyramid, GAP, and TIP. Studies have reported successful results for each of these methods, but the optimal technique remains unclear.

The literature suggests a rate of 6.5% for MIP among anterior hypospadias cases (9), but this was higher in our series (18.7%). Also, most of the patients were referred after evaluation for circumcision. We think this difference is probably secondary to being a referral center for hypospadias. This also shows that MIP cases are referred to our center, while surgeons in the surrounding hospitals commonly perform other distal hypospadias. This is reasonable because it is unclear whether corrective repair treatment is necessary for MIP, and no precise data shows the superiority of any technique among the various defined ones.

Zaontz, who defined the GAP technique, reported a urethrocutaneous fistula in one patient in his series of 24 patients (6). There were only two fistulas in three different studies regarding Pyramid urethroplasty, which covered a total of 60 patients (1,5,10). The complication rate of our patient series was consistent with the literature. It was observed that 3 out of 7 (8.3%) patients who developed complications were treated with DPMI, showing a significantly higher complication rate than the other three techniques. However, we do not believe this to be a conclusive result showing the inferiority of this technique as the choice of treatment is made according to the patient's anatomy, which may also determine surgical success.

In our study, the median treatment ages of MIP and other distal hypospadias cases operated on in the same time period were 33 months and 19 months, respectively. The median age of the MIP patients was significantly higher than the median age of the other distal hypospadias repairs (p=0.008). In a study conducted in our country, the median age of circumcision was reported as being 6 years (11). We attribute the significant age difference between the two groups in our study to the fact that infant circumcision is not widely performed in our country, and those patients with MIP are mostly diagnosed during circumcision when the prepuce is retracted.

Studies in the literature state that MIP is not associated with penile curvature or chordee (1,2,5). However, in a series of 118 patients, the overall penile curvature rate was reported as 24% (dorsal curvature was 19%, ventral curvature was 5%. The same study reported that ventral plication was required in 86% of cases with dorsal curvature (12). In our study, the penile curvature rate was 11%, and penile plication was required in 18.2% of those patients with penile curvature. Studies with a large patient series, such as our study, support the evaluation of penile curvature in MIP cases, which is a special form of distal hypospadias.

When MIP is diagnosed during circumcision, the common view is either to postpone the repair by consulting the patient's family or to repair it while the patient is under anesthesia, following family consent (10,13-16). However, it is also argued that the preputium and Dartos tissue are not necessary for MIP repair, and thus, circumcision can be performed (1,17-19). In our study, it was determined that the surgical success of MIP patients was not affected by circumcision. MIP repair was not required in any patient on whom we performed circumcision. No complications were observed in any patient who had been previously

circumcised and on whom we performed MIP repair. It was observed that previous circumcision did not change the repair technique applied in MIP cases (Duplay urethroplasty was performed for all five previously circumcised patients). MIP repair was not required in any patient in whom we performed circumcision. As in uncircumcised MIP patients, the choice of surgical technique was determined based on meatus localization, penile anatomy, and the surgeon's preference.

Study Limitations

The main limitation of our study was that it was based on a retrospective evaluation. Additionally, the surgical procedures were performed by multiple surgeons with varying experience. Surgical procedures were performed by multiple surgeons with varying experience. Another limitation of our study was the relatively short follow-up period. Since MIP patients include a wide anatomical spectrum, prospective studies are needed to record glans and meatus measurements, urethroplasty lengths, and curvature characteristics.

Conclusion

According to the results of our study, the complication rates, in the DPMI technique with mucosal incision were significantly higher than those of the other techniques. However, no difference was detected between the meatoplasty, Duplay urethroplasty, Pyramid urethroplasty and DPMI techniques in terms of the need for additional surgical intervention. In addition, in our series, it was observed that circumcision performed before repair in MIP patients did not change either the surgical technique or the complication rates, in contrast to popular belief. In conclusion, it can be inferred that prior circumcision or the preference for any specific surgical technique that preserves the urethral plate does not affect the success of MIP treatment.

Ethics

Ethics Committee Approval: Approval for the conduct of this study was obtained from the Medical Research Ethics Committee of Ege University Faculty of Medicine (approval no.: 23-3T/14, date: 09.03.2023).

Informed Consent: Written informed consent was obtained from the parents.

Authorship Contributions

Surgical and Medical Practices: U.B., A.T., S.T.B., İ.U., Concept: U.B., İ.U., Design: U.B., A.T., S.T.B., İ.U., Data Collection and/or Processing: U.B., A.T., Analysis and/or Interpretation: U.B., A.T., İ.U., Literature Search: U.B., Writing: U.B., A.T., S.T.B.

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