

1 UROLOGY – ORIGINAL PAPER

2 Kutlay technique for hypospadias repair

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8 Abstract

9 Objective Although many techniques have been
 10 described, new techniques with a wide range of
 11 therapeutic options are needed. The Kutlay technique
 12 is a novel technique that is based on the reconstruction
 13 of the neourethra with two horizontal meatal-based
 14 skin flaps. In the present study, the data of 31 patients
 15 who underwent surgery with the Kutlay technique are
 16 presented.
 17 Patients and methods Thirty-one patients with
 18 hypospadias with an average age of 5.6 years who
 19 did not have previous hypospadias repair were oper-
 20 ated on with the Kutlay technique. Ten patients had
 21 chordee. Among those patients, three patients were
 22 circumcised.
 23 Results The patients were followed up for 4–13
 24 months (average, 9.3 months). During the follow-
 25 up period, a fistula was observed in only one
 26 patient. None of the patients developed neourethral

dehiscence, meatal stenosis, urethra stricture, wound 27
 infection, penile torsion, hematoma, or persistent 28
 or recurrent chordee. On uroflowmetry studies, the 29
 maximum flow rate of the patients was approximately 30
 10.5 ml/s (range, 6–17 ml/s). The patients were 31
 observed to void with a single straight urinary stream 32
 in a forward direction. 33

Conclusion The Kutlay technique is a technique that 34
 is easily applied in patients with chordee and that 35
 provides a low risk of fistulas and acceptable func- 36
 tional and esthetic results. The factors that reduce the 37
 risk of fistula are the lack of the superposition of the 38
 suture lines of the skin and the urethra, the recon- 39
 struction of the urethra with well-vascularized flaps, 40
 and the replacement of the neourethra in its appropri- 41
 ate location through the tunnel created in the glans. 42

Keywords Hypospadias · Kutlay technique · 43
 Meatal-based flap · Chordee 4446

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Introduction 47

Hypospadias is a congenital anomaly with an incidence 48
 of 1/250 that is characterized by the opening of the 49
 external urethral meatus anywhere on the ventral 50
 surface of the penis other than its normal site on the 51
 glans penis [1]. This anomaly is most often accompa- 52
 nied by chordee. The external urethral meatus is usually 53
 located on the distal part of the penis in hypospadias [1]. 54
 The goal of the techniques to treat hypospadias is not 55

56 only to relocate the external urethral meatus to its
57 original anatomic location on the glans penis but also to
58 restore the chordee and to achieve an esthetic final
59 appearance. While accomplishing these goals, it is also
60 essential to reduce the risk of fistula and the recurrence
61 of chordee. Although more than 250 surgical techniques
62 have been described previously for these purposes, the
63 search for novel techniques with lower rates of compli-
64 cations continues. The Kutlay technique is a novel
65 technique described by Kutlay and Isik (the second
66 author of the present study) for hypospadias repair. This
67 technique is based on the use of two meatal-based flaps
68 to form the neourethra and can be used even for patients
69 with chordee [2]. The present study reports the results of
70 31 patients with hypospadias who underwent the Kutlay
71 technique.

72 Materials and methods

73 Thirty-one patients with hypospadias who visited our
74 clinic in the period between December 2008 and 2010
75 underwent the Kutlay technique. The mean age of the
76 patients was 5.6 years (range, 1.5–13 years). None of
77 the patients had been treated for hypospadias previ-
78 ously. All patients had preoperative subcoronal hypo-
79 spadias. In addition, 10 patients had accompanying
80 chordee pathology. Of the patients with chordee, 4
81 patients had mild chordee (below 20°), 3 patients had
82 moderate chordee (20°–40°), and 3 patients had severe
83 chordee (over 40°). After the correction of chordee in
84 patients with moderate and severe chordee, the
85 hypospadias in the distal location was transferred
86 to the mid-penile location. Three of the patients
87 were circumcised before surgery for hypospadias. The
88 patients who were older than 4 years were examined
89 with uroflowmetry in the postoperative 3rd month.

90 Surgical technique

91 The patients were under general anesthesia during the
92 operation. During the surgery, a loupe with a 2.5-times
93 magnification power was used by the surgeons. An
94 anchoring suture was placed on the glans penis. Then,
95 two flaps that were located transversely on either
96 side of the meatus and parallel to the corona were
97 designated. Urethral catheterization suitable for the
98 patient's age and the size of the urethra was per-
99 formed. None of the patients required suprapubic

100 urinary diversion. For the intraoperative examina-
101 tion of chordee, an artificial erection was created
102 by injecting serum physiologic (0.9% NaCl) into the
103 corpora cavernosa under a tourniquet. Incisions
104 extending to the tunica albuginea were made over
105 the distal edges of the meatal-based flaps. In patients
106 with chordee, chordee was corrected excising the
107 embryonic fibrotic bands overlying the tunica albu-
108 ginea. After this step, the distance between the ectopic
109 meatus and the outermost distal end of the glans penis
110 was measured. The lengths of the horizontal meatal-
111 based flaps were based on this measurement. Both skin
112 flaps were harvested above the tunica albuginea.
113 A sufficient amount of subcutaneous tissue was left in
114 place at the lateral edge of the meatus to ensure the
115 vascularity of the flaps. A subcutaneous tunnel was
116 formed in the glans penis using a no. 15 blade, which
117 was used to transfer the neourethra to the distal side of
118 the glans penis. Afterward, the urinary catheter was
119 removed and reintroduced by being passed through the
120 tunnel created in the glans. Depending on the size of
121 the meatus, a 6F or 8F silastic catheter was inserted
122 into the bladder. The meatal-based flaps were sutured
123 to each other in the midline around the catheter using
124 6/0 or 7/0 absorbable monofilament polyglyconate
125 synthetic sutures (Maxon®, Covodien Co, UK) with a
126 subcuticular continuous suture technique, beginning
127 from the meatus toward the distal end. The distal end
128 of the tube-formed flaps was passed through the tunnel
129 in the glans penis and fixed in the anatomic external
130 meatus location (Figs. 1, 2, 3, 4). The ventral penis
131 skin that remained beneath the subcoronal meatus
132 before surgery was sutured to the glans penis skin, and
133 the neourethra was covered completely with penile
134 skin. In patients with mild chordee, the penoscrotal
135 web resulting from the suturing of the penis skin to the
136 glans penis was corrected with Z-plasty (Fig. 4).
137 In patients with moderate or severe chordee, the
138 ventral penis skin was not sutured to the glans penis;
139 the incision lines located on both sides of the penis
140 were sutured to each other, generating a vertical scar in
141 the midline (Fig. 1). None of the patients were
142 circumcised. After the surgery, the patients were
143 treated with Coban pressure dressing (Coban®, Oper-
144 ational Medicine 2001, US). The pressure dressing
145 was discontinued on the postoperative 2nd day and
146 was replaced by daily dressing. On the postoperative
147 7th day, the patient was allowed to void after the
148 removal of the urinary catheter and was discharged.

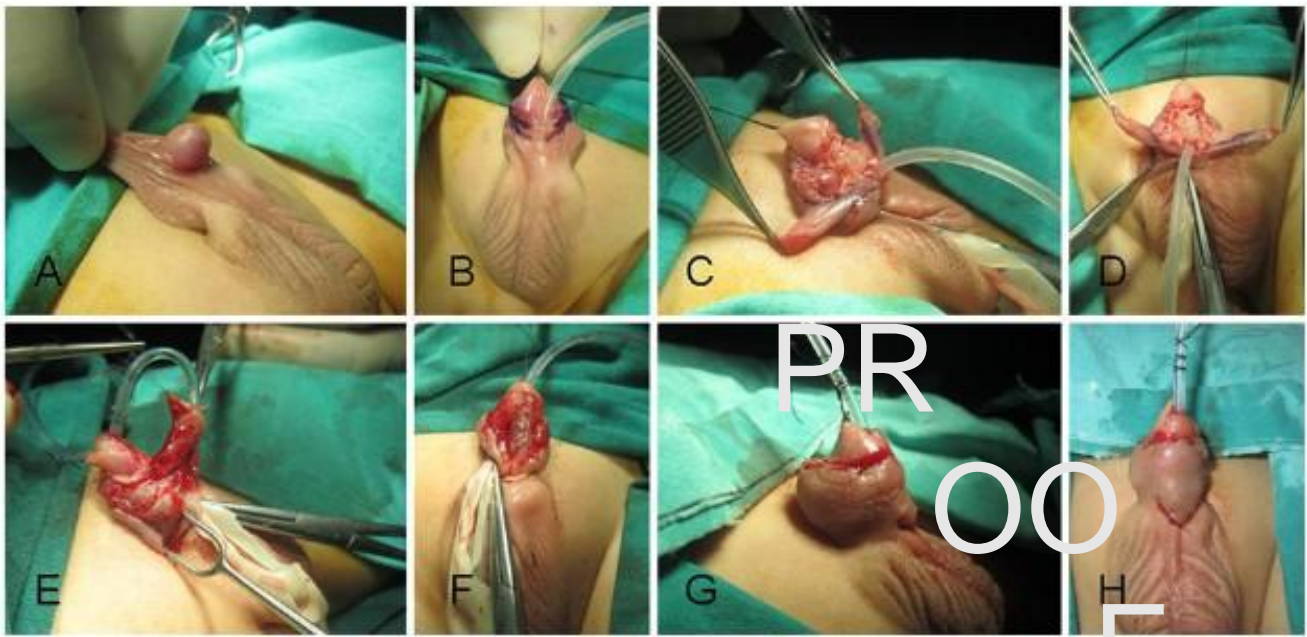


Fig. 1 Application of Kutlay technique in a patient with distal hypospadias and severe chordee. a Preoperative picture of the penis, b planning of the horizontal meatal-based flaps, c appearance of urethral defect following chordee correction in lateral

view, d picture of the harvested flaps, e appearance of neourethra after suturing the flaps, f transferring the neourethra through the tunnel in the glans, g lateral and h anterior views of the penis at the end of the surgery

149 Results

150 The follow-up period for the patients ranged from 4 to
 151 13 months (average, 9.3 months). During the follow-
 152 up period, a fistula was observed in only one patient.
 153 The fistula was observed beneath the corona in the
 154 patient on the 10th day after surgery. The parents of
 155 the patient had observed urinary weeping from the
 156 subcoronal area. Holding the fistula opening during
 157 urination was recommended. The correction of the
 158 fistula was planned for the 6th month after the
 159 surgery. None of the patients exhibited neourethral
 160 dehiscence, meatal stenosis, urethral stricture, wound
 161 infection, penile torsion, or hematoma. Persistent or
 162 recurrent chordee was not observed in the patients
 163 who had received treatment for chordee. In the
 164 postoperative 3rd month, uroflowmetry studies were
 165 performed for patients who were older than 4 years.
 166 The maximum flow rate was observed to be an
 167 average of 10.5 ml/s (6–17 ml/s) after uroflowmetric
 168 examinations. The patients were observed to void
 169 with a single straight urinary stream in a forward
 170 direction. In the postoperative period, the cosmetic
 171 results achieved were acceptable and satisfactory for
 172 the patients' families.

Discussion

Numerous techniques have been described previously
 for hypospadias repair; however, these techniques
 have not been standardized or perfected [3, 4]. The
 main factors guiding the surgeon in determining the
 type of the surgery are the site of the external meatus
 and whether chordee accompanies the hypospadias.
 Distal hypospadias accounts for 50–70 % of all hypo-
 spadias cases [1]. As the location of the meatus on the
 penis moves proximally, the hypospadias reconstruc-
 tion surgery becomes more sophisticated and less
 protected from complications with regard to the
 outcomes. Thus, the surgical techniques used for prox-
 imally located hypospadias that require more sophis-
 ticated procedures are not preferred by surgeons for
 distal hypospadias. The techniques used in patients
 with distal hypospadias are usually inadequate to treat
 proximal hypospadias. Therefore, there is a need for
 novel techniques with a wide range of therapeutic
 ability that can be used safely, particularly for patients
 with chordee. Currently, meatal advancement urethro-
 plasty (MAGPI), the glans approximation procedure
 (GAP), Mathieu's technique, and tubularized incised
 plate urethroplasty (TIPU) (Snodgrass technique) are

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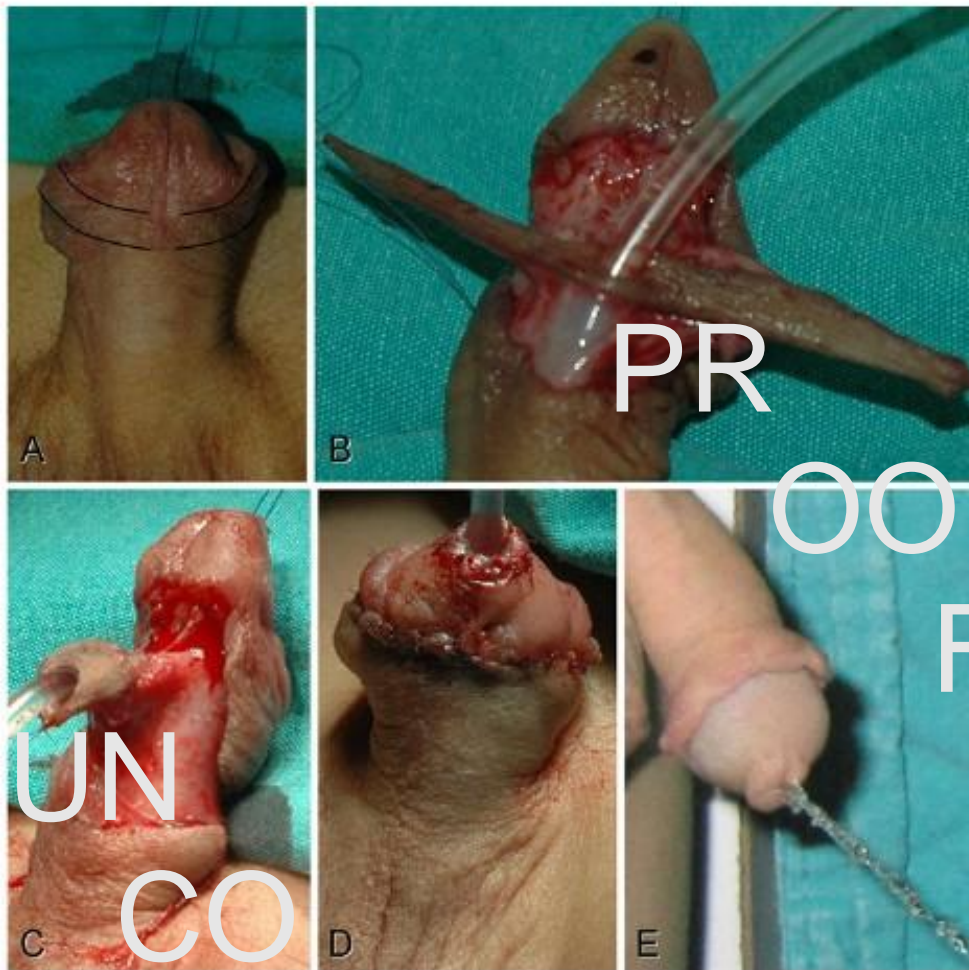


Fig. 2 a Preoperative view of the hypospadias penis and planning of the horizontal meatal-based flaps, b appearance of the harvested flaps, c tubularized flaps, d closure of the penis

after the surgery, and e view of the patient during urination at the 6th months after the correction

197 the most reliable and most commonly accepted proce-
 198 dures for distal hypospadias repair [4]. Among the e
 199 e techniques, Snodgrass and Mathieu's techniques are
 200 the most widely used, and favorable results are often
 201 reported [1].

202 Since hypospadias surgery was first performed, the
 203 most serious complication for patients and surgeons is
 204 the formation of urethrocutaneous fistulas [5]. With all
 205 techniques that are used for hypospadias repair, the
 206 incidence of urethrocutaneous fistulas varies from 4 to
 207 20 % in a larger series [6, 7], whereas the incidence
 208 of meatal stenosis varies from 0 to 21 % [8]. The inci-
 209 dence of fistulas is lower with methods that preserve
 210 the urethral plate, such as the TIP and Onlay flap, in
 211 comparison with methods such as the prepuceal flap
 212 and tube urethroplasty [9]. The rate of fistula forma-
 213 tion has been reduced by covering the surgical area

with well-vascularized tissue, using appropriate
 sutures and instruments, and implementing advanced
 surgical techniques [10]. The surgical technique pre-
 sented here was described in 2010 by Kutlay et al. [2].
 In a series of 10 patients, Kutlay et al. [2] did not
 observe fistula formation, meatal stenosis, neourethral
 dehiscence, or other complications. In the patient
 population presented here, the rate of urethrocutane-
 ous fistulas was found to be 3.2 %. Development of a
 fistula is the most common complication of hypospa-
 dias surgery, and it requires reoperation. The super-
 position of the tubular structure and the skin suture line
 where the skin overlaps the inner tubular structure is
 an important cause of the wound's development
 [11–13]. One of the most important factors that
 increase the risk of fistula in hypospadias repair is
 the superposition of the skin repair line and the

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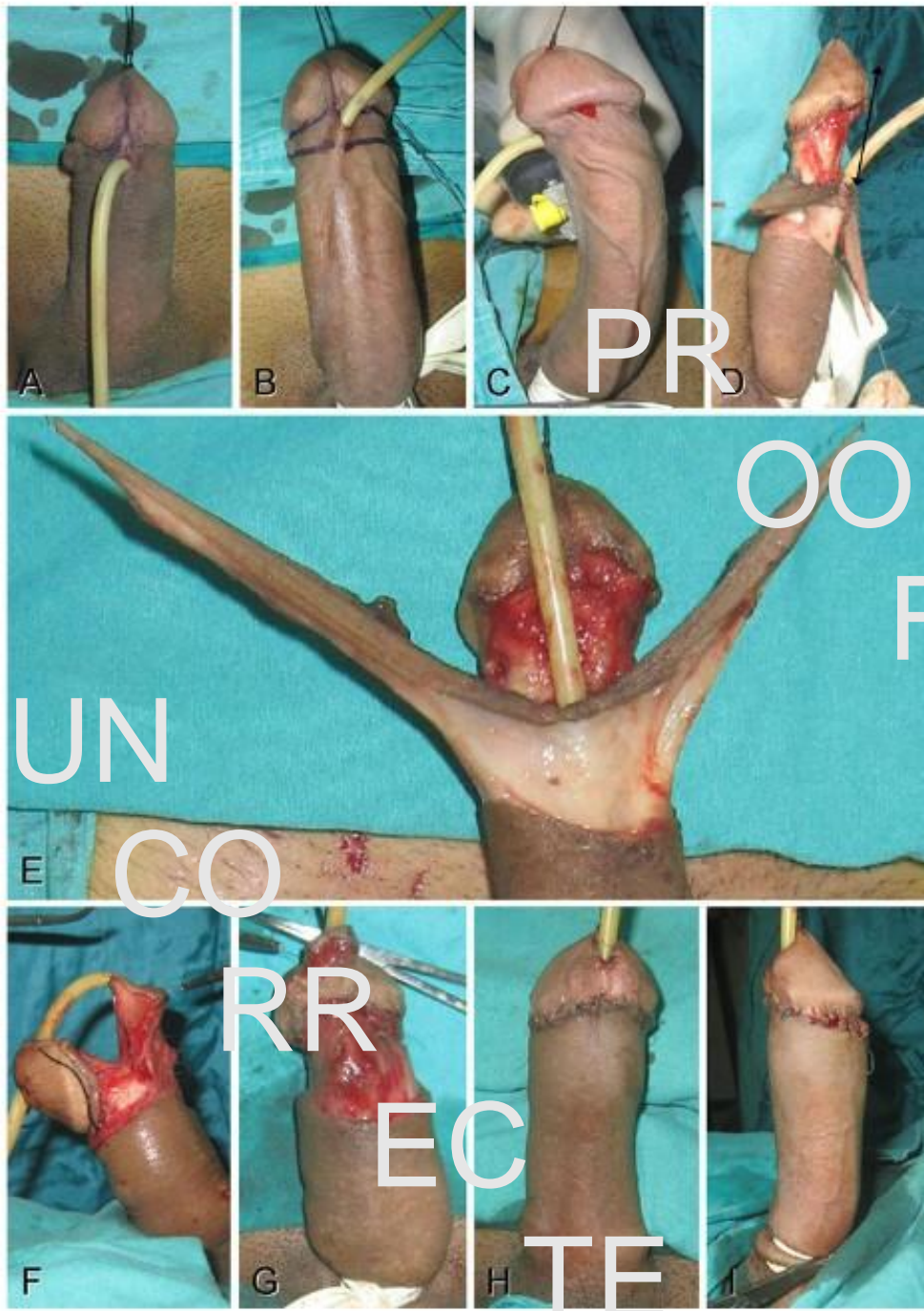


Fig. 3 a Preoperative view, b planning of the Kutlay's technique, c view of mild chordee following the artificial erection, d lateral view of the penis after the chordee removal (arrow indicate the urethral defect), e appearance of the harvested

meatal-based flaps, f picture of the tubularized horizontal flaps, g transferring the neourethra through the tunnel in the glans, h appearance of the penis after the surgery, and i picture of the penis following the artificial erection after the surgery

231 neourethra repair line. To avoid this situation, several
 232 flaps may be harvested from different parts of the penis
 233 and transferred between the neourethra and the skin as
 234 a protective intermediate layer [14]. Retik et al. [15]
 235 used an asymmetric flap harvested from the dorsal

penis skin and the prepuce to cover the neourethra.
 236 Sozubir and Snodgrass attempted to create an addi-
 237 tional layer between the urethra repair line and the skin
 238 repair line by transferring a dorsal dartos flap to the
 239 ventral surface of the penis through a buttonhole [16].
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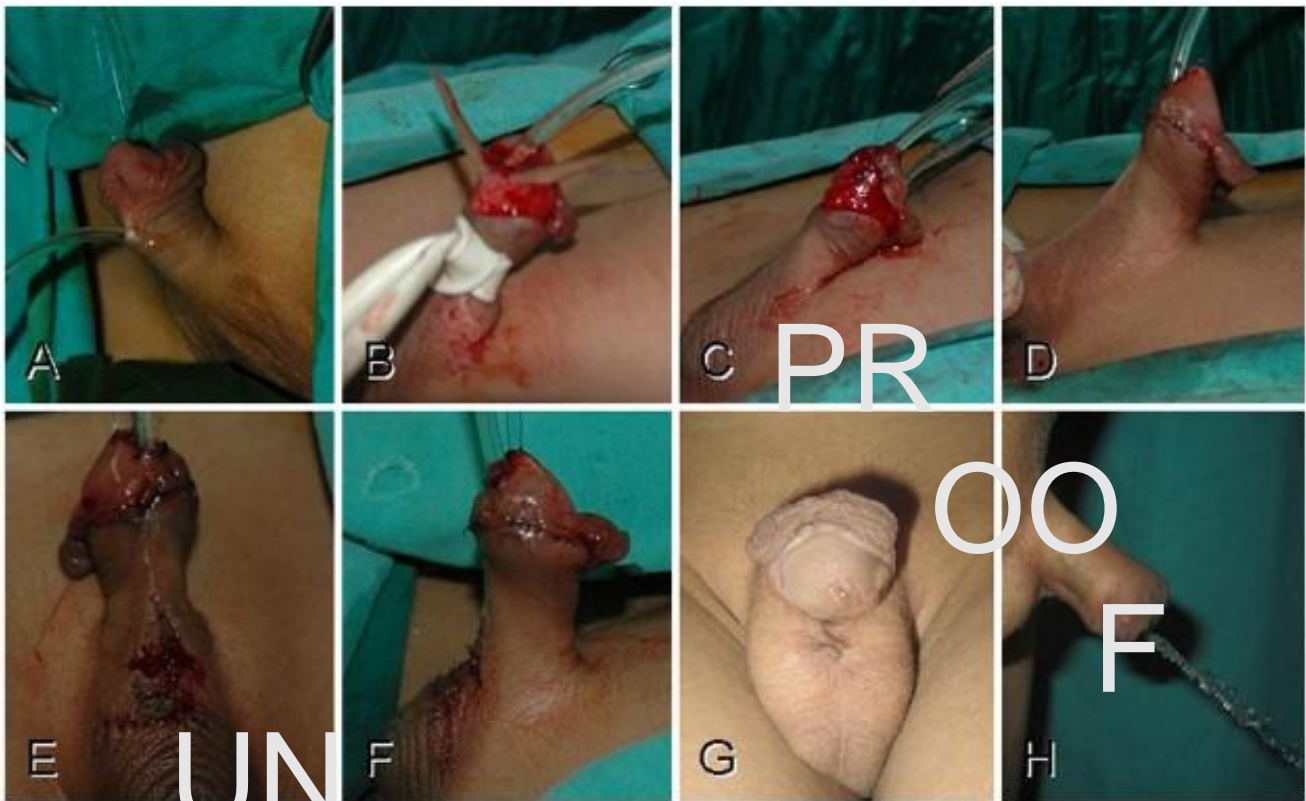


Fig. 4 a Preoperative view of the hypospadiatic penis, b appearance of the harvested flaps, c view of the penis after transferring the tubularized horizontal flaps, d suturing the skin and view of the web in the periscrotal junction, e appearance of

z-plasty for correction of the web, f lateral view at the end of the surgery, g anterior view of the penis, and h lateral picture during the urination at the 6th months after the surgery

241 In the preceding 10 years, the spongioplasty, in which
 242 paraurethral spongial remnants are repaired in the
 243 midline, has been used as a layer separating the urethra
 244 repair line from the skin repair line [7, 13]. In the
 245 Kutlay technique, there is no need for an additional
 246 flap to cover the neourethra because the urethra repair
 247 line is covered with the intact penis skin, on which
 248 there is no incision, particularly in patients without
 249 chordee.

250 In the flip-flap technique used for distal (anterior)
 251 hypospadias, a meatal-based flap prepared from the
 252 penis skin proximally is transferred distally with a
 253 180° rotation. In this technique, the pedicle is com-
 254 pressed, and the risk of fistula increases as the length
 255 of the flap becomes longer [19]. However, in Kutlay's
 256 hypospadias repair technique, the arc of rotation is
 257 below 90°, and the problems of nourishing that can
 258 occur with the flip-flap and other such techniques do
 259 not occur because of the absence of folds. Moreover,
 260 the pedicle of the flap is wider and thicker than the
 261 flip-flap because the dartos fascia, which is of great

importance for the vascularity of the flaps, can be left
 mostly intact.

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 264 The most common anomaly accompanying hypo-
 265 spadias is the coexistence of chordee. Removal of
 266 chordee is an important step in hypospadias repair.
 267 There are difficulties in chordee repair in Mathieu's
 268 technique and in the tubularized incised plate urethro-
 269 plasty (TIPU) technique, both of which are used
 270 frequently in patients with distal hypospadias.
 271 Mathieu's technique has been modified by Devine
 272 and Horton to overcome these difficulties [20, 21].
 273 However, in these modifications of the Mathieu's
 274 technique, the length of the flap harvested for the
 275 neourethra increases, and consequently, the problems
 276 regarding vascularity and the risk of fistulas are
 277 exacerbated. In TIPU, Snodgrass attempted to restore
 278 the curvature by a dorsal plication in hypospadias
 279 patients with a minimal curvature [22]. However, in
 280 those cases in which the main problem is penile
 281 chordee, the intervention is made on the dorsal part of
 282 the penis, where there is no anatomic problem, to

283 restore the ventral surface of the penis. For patients
 284 with severe chordee, Snodgrass proposed to dissect the
 285 urethra beginning at the glans up to the bulbous urethra
 286 instead of the dorsal plication. Snodgrass argued that
 287 the urethra transection would not be necessary after
 288 chordee was corrected in this manner [23]. It is not
 289 clear what impact of widening urethral dissection has
 290 on vascularity of the urethra. In the TIPU tech-
 291 nique, dorsal plication or large urethral dissection is
 292 attempted because of the difficulty of correcting
 293 chordee on the ventral surface of the penis during
 294 the reconstruction of the neourethra. However, dorsal
 295 plication or large urethral dissection is not needed in
 296 hypospadias repair techniques that can also be used for
 297 patients with chordee. Additionally, using plication on
 298 the dorsal part of the penis leads to shortening the
 299 length of the penis. In contrast, techniques allowing
 300 the correction of chordee with the excision of fibrotic
 301 bands lengthen the penis. Furthermore, in cases of
 302 reconstruction of the urethra from the fibrotic urethral
 303 plate, as in Snodgrass's technique, a long-term chor-
 304 dee recurrence may be observed in the postoperative
 305 period [22]. Imamoglu et al. [24] reported that the
 306 status of the urethral plate was important in hyospa-
 307 dias repair. They suggested that the TIPU technique
 308 could not be used if the urethral plate was insufficient;
 309 in such a case, they recommended the use of Mathieu's
 310 technique [24]. In the Kutlay technique, the penis skin
 311 and the urethra can be peeled over the tunica albuginea
 312 beginning at the distal to the ectopic meatus proxi-
 313 mally. Therefore, chordee in the penile shaft can be
 314 exposed and excised easily, regardless of whether the
 315 urethral plate is sufficient.

316 In conclusion, Kutlay's technique has major advan-
 317 tages, for example, providing low risk of fistula
 318 allowing the efficient correction of chordee as a single-
 319 stage technique, achieving postoperative urethral v-
 320 metry results within normal ranges, and creating a
 321 cosmetic and functional penis. Preserving the prepuce
 322 during the implementation of this technique may allow
 323 secondary repairs for patients who develop complica-
 324 tions. The main factors reducing the risk of fistulas
 325 include that the skin and urethra suture lines are not
 326 superposed, the urethra is reconstructed with well-
 327 vascularized flaps, and the neourethra is transferred to
 328 its appropriate location through the tunnel created
 329 within the glans. Kutlay's technique can be used even
 330 in patients with mid-penile hypospadias, although it is

primarily used in distal hypospadias cases. However,
 in those cases, there may be a vertical scar line on the
 penile skin. For these patients, the skin repair line may
 be shifted laterally to the neourethra repair line to
 reduce the risk of fistulas.

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