

## Is the Dorsal Dartos Flap Rotation Technique Successful in Children with Isolated Penile Torsion?

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**Purpose:** Penile torsion is a counterclockwise rotational anomaly of the penile shaft or glans. We aimed to evaluate the results of the dorsal dartos flap rotation technique in children with isolated penile torsion.

**Materials and Methods:** A total of 5470 boys who applied to our clinic between 2012 and 2022 for circumcision were evaluated for congenital isolated penile torsion. They were classified according to the degree and direction of torsion, and clinical findings were analyzed. According to the degree of torsion, penile degloving or the dorsal dartos flap rotation technique with circumcision was performed. Patients whose torsion was corrected after penile degloving were excluded from the study. The results of the dorsal dartos flap rotation technique were evaluated.

**Results:** Congenital isolated penile torsion  $\geq 60^\circ$  was identified in 1.04% ( $n = 57$ ) of the children. Eight patients whose torsion was corrected after penile degloving were excluded from the study. The 49 patients who underwent dorsal dartos flap rotation had a mean age of 4.94 years (range, 1-9) and a mean operation time of 29.9 min (range, 20-40). The mean degree of torsion was  $77.6^\circ$  (range, 60-110). The mean operation times in the  $< 90^\circ$  and  $\geq 90^\circ$  dorsal dartos flap groups were statistically significant ( $p < 0.05$ ). A statistically significant difference in residual torsion was found between the  $< 90^\circ$  and  $\geq 90^\circ$  dorsal dartos flap groups ( $p < 0.05$ ). At the postoperative 1st and 6th-month follow-ups, torsion of less than 10 degrees was observed in 3 patients who underwent the dorsal dartos flap rotation technique. No residual torsion was observed in other patients.

**Conclusion:** Isolated penile torsion cases should not be overlooked during circumcision. It seems possible to obtain successful results with dorsal dartos flap rotation in moderate and severe torsions.

**Keywords:** dorsal dartos flap, penile torsion, surgical repair, child

### INTRODUCTION

The rotation of the shaft of the penis, usually counterclockwise, is called penile torsion. Although it is usually associated with hypospadias and chordee, it may rarely be seen in isolation. The actual incidence of penile torsion is unknown. Studies have reported that the incidence ranges between 1.7-27%, and the rate of severe torsion is 0.7%.<sup>(1,2)</sup> It may be congenital or due to surgery applied to the penis.<sup>(3-5)</sup> According to the degree of torsion, it is classified as mild ( $< 45^\circ$ ), moderate ( $45^\circ$ - $90^\circ$ ), and severe ( $> 90^\circ$ ). The surgical method applied varies according to the degree of torsion and the presence of additional anomalies.<sup>(6,7)</sup>

In this study, we aimed to present the results of patients with isolated penile torsion who were referred to our clinic for a circumcision procedure and were operated on with the dorsal dartos flap rotation technique.

### MATERIALS AND METHODS

Between 2012 and 2022, 5470 circumcision procedures were performed in our clinic. During circumcision examination and procedure, 57 cases of isolated penile torsion were identified. The files of these patients who underwent surgical intervention were retrospectively analyzed. The study was retrospective and conducted in

accordance with the Declaration of Helsinki. While recording patient data, patients were informed that these data would be used for scientific purposes, and written informed consent was obtained from the patients' families for the use of images and data.

The study was approved by the Tokat Gaziosmanpaşa University Faculty of Medicine Clinical Research Ethics Committee (Approval date and number: 28.03.2024 / 83116987-234).

Eight patients with hypospadias and penile chordee, who had undergone penile surgery for any reason, who had undergone circumcision, whose torsion was less than 60 degrees, and whose torsion was corrected with penile degloving were excluded from the study. Patients with congenital isolated penile torsion above 60 degrees were included in the study. Data from 49 patients who met these criteria were evaluated. Age, degree of torsion, operation time, dorsal dartos flap rotation technique, and residual torsion were recorded. All surgical procedures were performed by the same doctor.

### Surgical technique

During the external genitalia examination of the cases, a preliminary evaluation was made by considering the course of the median raphe line on the penile corpora and glans (**Figure 1a**). Following a penile block procedure under general anesthesia, adhesions in the prepuce

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**Table 1.** Baseline characteristics of the patients

	N	Median	95% CI for the median	IQR
Age (year)	49	5.0	4.0 - 5.0	3.3
Operation time (min.)	49	30.0	30.0 - 30.0	5.0
Torsion degree	49	75.0	70.0 - 80.0	10.0

CI: Confidence interval; IQR: Interquartile range

were opened, and glans torsion was controlled (**Figure 1b**). Following circumcision with the dorsal slit technique, the penile skin was degloved from the circumcision line to the root of the penis. After a rubber tourniquet was placed on the root of the penis, an artificial erection was created, and the improvement in torsion was controlled. No additional procedure was performed in patients whose torsion was corrected. A dorsal dartos flap was prepared from the right side of the penis in patients without improvement. The prepared flap was sutured with 4-0 Vicryl suitable for the penis body to provide clockwise rotation of the penile shaft (**Figure 1c,1d,1e**). Following bleeding control, the folds were closed in the anatomical plane, and the residual torsion condition was evaluated (**Figure 1f**).

Penile torsion was corrected in a total of 49 patients with the dorsal dartos flap rotation technique. After the surgery, a pressure dressing with an elastic bandage was applied, and patients were discharged with instructions to remove the elastic bandage 3-4 days later. Patients were called for follow-up visits every week starting from the 5th postoperative day. Wound healing was followed. Torsion corrections below 10° were considered a success. Patients were called for follow-up visits at the 1st and 6th months.

### Statistical analysis

Statistical analyses were performed with MedCalc (version 20.009; Ostend, Belgium) statistical package program. The G\*Power version 3.1.2 analysis program was used to calculate the power of the study. Number, frequency, percentage, mean, median, standard deviation, and interquartile range were used to describe the data statistically. The Shapiro-Wilk normality test was used to evaluate the normality of the groups, and Q-Q graphs were used to visually evaluate the data. Levene's test (F-test) was used to evaluate the homogeneity of the variances of the groups. The independent *t*-test was used for pairwise comparisons of the groups conforming to normal distribution. The Mann-Whitney U test was used for groups that did not fit the normal distribution. The Fisher exact test was used for the evaluation of categorical data by considering the assumptions of the Chi-Square test. Results were presented as  $p < 0.05$  or  $p < 0.001$  according to the level of significance.

### RESULTS

Congenital isolated penile torsion  $\geq 60^\circ$  was identified in 1.04% ( $n = 57$ ) of the children. Eight patients whose

torsion was corrected after penile degloving were excluded from the study. The 49 patients who underwent dorsal dartos flap rotation had a mean age of 4.94 years (range, 1-9) and a mean operation time of 29.9 min (range, 20-40). The mean degree of torsion was 77.6° (range, 60-110) (**Table 1**). No connection was observed between the degree of torsion and age (**Table 2**). The mean operation times in the  $< 90^\circ$  and  $\geq 90^\circ$  dorsal dartos flap groups were statistically significant ( $p < 0.05$ ) (**Table 3**). The rate of residual torsion was statistically significantly different between the  $< 90^\circ$  and  $\geq 90^\circ$  dorsal dartos flap groups ( $p < 0.05$ ) (**Table 4**). At the postoperative 1st and 6th-month follow-ups, torsion of less than 10 degrees was observed in 3 patients who underwent the dorsal dartos flap rotation technique (**Table 5**) (**Figure 2**). No residual torsion was observed in other patients. Penile appearance was satisfactory for physicians and parents.

### DISCUSSION

There is no definite opinion about the frequency of penile torsion, which usually develops as a result of the counterclockwise rotation of the penile shaft. The prevalence of penile torsion varies in different studies. In a study conducted on 5018 newborns in North India, the prevalence of isolated penile torsion above 30 degrees was reported as 1.97%.<sup>(8)</sup> Eroglu E and Gundogdu G from Turkey<sup>(9)</sup> reported the rate of isolated penile torsion as 20% and the rate of moderate and severe torsion requiring surgical correction as 2.15% in their study of 1000 newborns. Hamed M. El Darawany et al.<sup>(6)</sup> found 31.2% penile torsion in 1650 patients aged 2 weeks to 6 years who presented for circumcision. In this study, only 3.7% of the cases were torsions above 45 degrees. As can be seen, although the rates of penile torsion are different and high in the studies, moderate and severe torsion requiring surgical correction is much less common. In our study, we found congenital isolated penile torsion  $\geq 60^\circ$  in 1.04% ( $n = 57$ ) of 5470 patients who presented with a request for circumcision. In our study, cases with moderate and severe isolated penile torsion were included; cases with additional anomalies and penile torsion below 60° that was corrected with penile degloving were not included. The reason for the lower penile torsion rate in our study compared to other studies may be that the mean age of our patients was older, the sample size was large, and mild penile torsion cases

**Table 2.** Age Data of Patients with Dartos Flap Rotation According to The Degree of Torsion.

	Dartos Flap Rotation $< 90$ Degree				Dartos Flap Rotation $\geq 90$ Degree				p-Value
	N	Mean	(95% CI)	SD	N	Mean	(95% CI)	SD	
Age (year)	40	5.05	(4.43 - 5.66)	1.93	9	4.44	(3.05 - 5.83)	1.81	NS

NS: Not significant; CI: Confidence interval; SD: Standard deviation

**Table 3.** Operation Time Data of Patients with Dartos Flap Rotation According to The Degree of Torsion

	Dartos Flap Rotation < 90 Degree				Dartos Flap Rotation ≥ 90 Degree				p-Value
	N	Median	(95% CI)	IQR	N	Median	(95% CI)	IQR	
Operation time (min.)	40	30.0	(26.3 - 30.0)	5.0	9	30.0	(30.0 - 39.3)	6.25	< 0.01**

\*\* Significant difference at <0.01 level according to Mann-Whitney U test; CI: Confidence interval; IQR: Interquartile range

were not included in the study.

Although the etiology of penile torsion is not clearly known, various hypotheses have been proposed. It has been suggested that it develops as a result of abnormal fusion of endodermal and/or ectodermal folds; there are also authors who think that it is due to a developmental defect of the penile fascia. It has been reported that torsion is due to the abnormality in Buck's fascia and therefore there is no improvement in torsion with degloving alone.<sup>(10,11)</sup> In our study, the dorsal dartos flap rotation technique was applied to 49 patients since penile degloving did not provide adequate correction. Numerous surgical techniques are used for the correction of penile torsions. There is a consensus among surgeons that circumcision and simple skin alignment are sufficient for the correction of mild congenital isolated penile torsions, but surgical correction is required for moderate to severe torsions and torsions accompanied by additional anomalies.<sup>(9,12)</sup> However, there is no consensus on the ideal surgical method. The more complex the surgical method applied, the higher the rate of complications. Aldaqadossi et al.<sup>(13)</sup> compared the results of congenital penile torsion repair by suturing the tunica albuginea to the pubic periosteum with the dorsal dartos flap technique and reported that the dorsal dartos flap was easier and had fewer complications. In recent years, the degloving and skin realignment method is preferred for isolated penile torsion repair because of its simplicity and ease of application.<sup>(8,9)</sup> In this technique, degloving up to the penoscrotal level allows the disconnection between the penile shaft and the skin. Penile torsion is partially corrected by separating the penile shaft from the skin, and the remaining torsion can be corrected by realignment. However, in patients with a high degree of torsion, it is difficult to bring the raphe to the midline when realigning. Trying to bring the raphe to the midline causes the laterally positioned raphe and skin to torsion the penile shaft again. For this reason, an additional surgical procedure or more invasive methods are used, especially in severe torsions.<sup>(7,14,15)</sup> El Darawany et al.<sup>(6)</sup> used different techniques such as degloving and skin realignment in 21 of 62 patients with isolated penile torsion over 45 degrees and degloving and excessive skin tugging or dartos flap in the other 41 patients. Marret et al.<sup>(16)</sup> stated that torsions between 45-90 degrees were corrected with degloving-skin alignment in 75% of their patients, while 25% needed a dartos flap. They also reported that 86% of patients with torsions of more than 90 degrees needed a dartos flap to correct the

torsion and that the need for the dartos flap procedure was directly proportional to the degree of torsion.

In our study, in all moderate and severe penile torsion cases, degloving was performed up to the penoscrotal level, as in other studies, and the penile shaft was separated from the skin and released. The torsion, which was released and partially corrected by degloving, was easily corrected by leaving the raphe where it was positioned. It was not difficult to bring the raphe to the midline. In 8 patients with up to 60 degrees of torsion, no additional surgical procedure or a more invasive technique was required. In 49 patients, additional surgery was required, and moderate to severe torsions were corrected using the dorsal dartos flap rotation technique. In our study, it was determined that the duration of surgery increased with the increase in the degree of torsion, and there was an increase in the rate of residual torsion after surgery. All our findings were consistent with the literature.

#### Limitations

The limitations of the study include the small number of patients, the single-center and retrospective nature of the study, and the need to compare more surgical techniques.

#### CONCLUSIONS

Isolated penile torsion cases should not be overlooked during circumcision. In our study, we concluded that the dorsal dartos flap rotation technique was successful in moderate and severe torsions. We would like to state that more prospective, randomized, controlled studies should be performed to evaluate the efficacy of the dorsal dartos flap rotation technique.

#### SUMMARY

In boys with moderate to severe isolated penile twisting, a surgical technique using a dorsal dartos flap was found to be a successful method for correction during circumcision, with low rates of remaining torsion.

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**Table 4.** The Relationship between The Degree of Torsion and Residual Torsion in Patients with Dartos Flap Rotation.

		Dartos Flap Rotation < 90 Degree			Dartos Flap Rotation ≥ 90 Degree		p-Value
		n	%	n	%		
Residual torsion	Not seen	40	100.00%	6	66.70%	<0.01*	
	<10°	0	0.00%	3	33.30%		

\* Significant difference at < 0.01 level according to Fisher's exact test

**Table 5.** Logistic Regression Analysis for Torsion Degree.

Variables	B	SE	p-Value	OR	(95% CI)	Overall Model Fit p-Value
Age (year)	-0.377	0.29	0.20	0.69	(0.387 - 1.214)	0.001
Operation time (min.)	0.129	0.10	0.19	1.13	(0.94 - 1.379)	
Residual torsion (<10° vs. Not seen)	22.09	0.997	1.29E+10	(0.00 - )		
Constant	-4.22	3.49719	0.226			

B: Beta coefficient; SE: Standard error; OR: Odds ratio; CI: Confidence interval

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Figure 1a

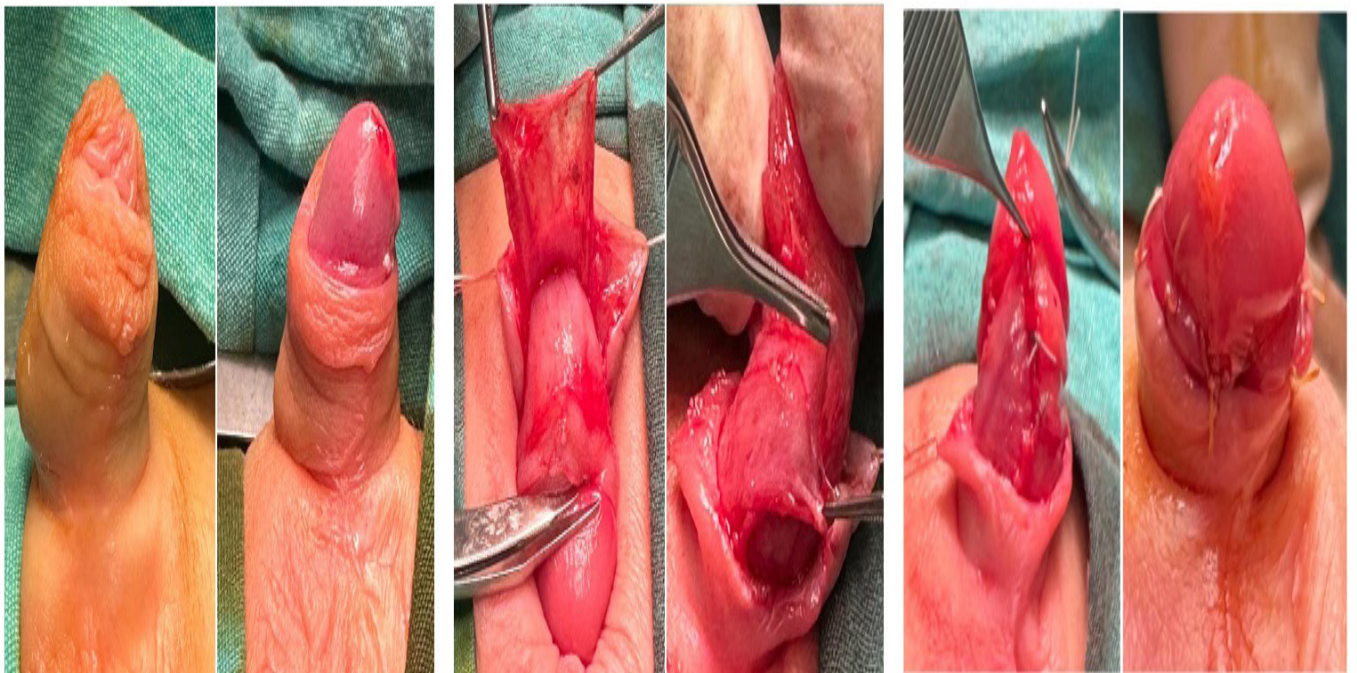
Figure 1b

Figure 1c

Figure 1d

Figure 1e

Figure 1f



**Figure 1.** Stages of Dorsal Dartos Flap Rotation Technique.

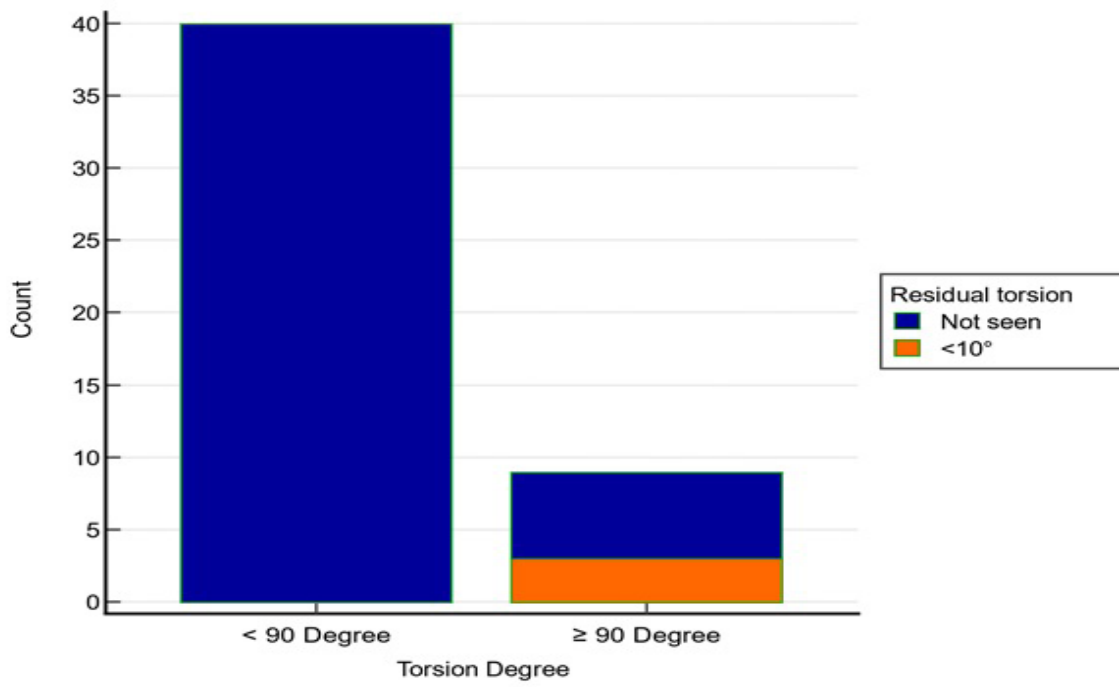


Figure 2. The Relationship between The Degree of Torsion and Residual Torsion.

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