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Long-term Results of the Congenital Penile Curvature Following Modified Nesbit Plication with Monofilament Absorbable Sutures

Konjenital Penil Kurvatürde Absorbable Monofilament Sütür Kullanılarak Yapılan Modifiye Nesbit Plikasyonunun Uzun Dönem Sonuçları

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ABSTRACT Objective: To analyze the long-term results of the congenital penile curvature (CPC) corrected with modified Nesbit plication procedure using monofilament absorbable sutures. **Material and Methods:** From March 2008 to March 2018, 54 adult patients with CPC underwent the modified Nesbit plication surgery procedure. Absorbable monofilament poliglecaprone-25 suture was used for plication in all patients. Patients older than 16 years of age in March 2008 were included in the study which have minimum 20 degree penile curvature. Long -term follow-up was median 68 (16-120) months and data were available for 48 patients. **Results:** All of the patients were curvature-free at the end of the operation. At the time of the follow-up examination, 40 (83.3%) patients were curvature-free. Five (10.4%) had recurrent curvature less than 15 degree and the other 3 (6.2%) had curvature recurrence >15 degree. Disturbing palpable suture knot was detected in only 3 (6.2%) patients. While 38 (79.2%) patients were very satisfied with the operation, 6 (12.5%) stated to be moderately satisfied and 4 (8.3%) were unsatisfied at all. **Conclusion:** Absorbable poliglecaprone-25 suture provides high success rate in CPC surgery and significantly reduces suture related complications.

Keywords: Reconstructive surgical procedures; penis; abnormalities; penile erection; suture

ÖZET Amaç: Monofilament emilebilir sütür kullandığımız modifiye Nesbit plikasyon prosedürü ile düzeltilen konjenital penil kurvatürün [congenital penile curvature (CPC)] uzun dönem sonuçlarını incelemek. **Gereç ve Yöntemler:** Mart 2008 ile Mart 2018 tarihleri arasında 54 erişkin CPC hastasına modifiye Nesbit plikasyon prosedürü uygulanmıştır. Tüm hastalarda plikasyon için emilebilir monofilament poliglecaprone-25 sütür kullanılmıştır. En az 20 derece penil kurvatürlü Mart 2008 tarihinde 16 yaşından büyük olan hastalar çalışmaya dâhil edilmiştir. Ortalama 68 (16-120) aylık uzun dönem takip süresi sonunda 48 hastanın verilerine ulaşılabilmiştir. **Bulgular:** Operasyon sonunda tüm hastaların kurvatürü tam olarak düzelmiştir. Takip sürecindeki muayenede ise 40 (%83,3) hastanın kurvatürünün düzeldiği, 5 (%10,4) hastada 15 dereceden küçük kurvatür rekürrensi olduğu ve diğer 3 (%6,2) hastada da 15 dereceden büyük kurvatür rekürrensi olduğu görülmüştür. Sadece 3 (%6,2) hastada rahatsız edici palpe edilebilir sütür varlığı tesbit edilmiştir. Operasyon sonunda 38 (%79,2) hasta prosedürden çok memnun olduğunu belirtirken, 6 (%12,5) hasta orta düzeyde memnun olduğunu ve 4 (%8,3) hasta ise memnun olmadığını belirtmiştir. **Sonuç:** Emilebilir monofilament poliglecoprone-25 sütür CPC cerrahisinde yüksek başarı oranı sağlamaktadır ve sütüre bağlı komplikasyonları önemli ölçüde azaltmaktadır.

Anahtar Kelimeler: Rekonstruktif cerrahi işlemler; penis; anormallikler; penil ereksiyon; sütür

Congenital penile curvature (CPC) described as a condition in which the erect penis is not straight and there are no urethral or penile anomalies such as epispadias or hypospadias.[1] It may arise from the developmental arrest of tunica albuginea of the corpora cavernosa during the embryogenesis.[2] Curvature is typically ventral, but is can also be dorsal, lateral or mixed.[3] The prevalence of CPC has been reported approximately 0.6%.[4] Nesbit performed the first operative correction of the penile curvature by excising

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ellipses from the outer curvature of the penis in 1965.[5] Following this development most surgeons performing tunical plication utilized non-absorbable sutures, which could cause certain suture-related complications such as palpable suture knot or granulomas, penile pain, penile numbness.[6,7] In this study, we aimed to reduce the suture related complications by using monofilament poliglecaprone-25 suture and evaluated the long-term outcome, effectiveness and patient satisfaction.

MATERIAL AND METHODS

After obtaining approval from the local ethics comittee of our hospital (Date: 23.02.2021, Protocol no: 2012-KAEK-15/2237), the data of 54 adult patients who underwent CPC surgery in our clinic between March 2008 and March 2018 were analyzed retrospectively. Data were available for 48 of all the patients. Patients with pure CPC at a minimum of 20 degrees and a maximum of 60 degrees and who were sexually active and had physical or psychological problems in sexual intercourse due to curvature were included in the study. All of the patients included in the study were adult patients older than 16 years. Patients in the prepubertal-pediatric age group were excluded from the study. Patients with Peyronie's disease or chordee with hypospadias-epispadias were also excluded. Patients with a history of psychological or vascular-organic erectile dysfunction were not included in the study. The preoperative curvature degree and the length of the penis was determined by artificially inducing erection by 30 mg intracavernous injection of papaverine. While the curvature degree was determined by using a goniometer, the length of the penis was measured with a ruler. Preoperative erectile functions of the patients were determined by using International Index of Erectile Function-5 (IIEF-5) scoring which was validated in Turkish.[8] After the preoperative preparation, all of the patients underwent superficial modified Nesbit procedure by the same surgeon. A 16-18 F foley catheter was placed in the bladder after a suspension suture was placed on the glans penis. Following a complete penile degloving and releasing of the Dartos fascia up to Buck's fascia, an artificial erection was obtained using saline injection after placing a proximal tourniquet (Figure 1). Medial dissection technique was used in patients with ventral curvature and lateral dissection technique was used in patients with lateral or dorsal curvature. For the lateral dissection technique, the Buck's fascia was lifted bilaterally from the 5 and 7 o'clock position to the 1 and 11 o'clock positions to preserve the neurovascular bundle (NVB). For the medial dissection technique, after the Buck's fascia was dissected, the deep dorsal vein and NVB were preserved by careful minimal dissection from medial to lateral. Lateral dissection technique was used for the dorsal curvature and the careful lateral dissections were performed bilaterally by protecting the urethra from both sides of the corpus spongiosum. After opening the Buck's fascia, the contralateral side to the maximal curvature of the corpus cavernosum was holded on with an allice clamp to identify the optimum distance for plication and marked with a marker pen. In addition, it was taken into consideration that a 1 mm long transverse tunica albuginea excision from the opposite side of the curvature was required for approximately every 10 degrees of curvature in determining the tunical excision area. A split-thickness transverse superficial ellipsoid incision was made to tunica albuginea. Three-zero absorbable poliglecaprone-25 ($C_{10}H_{14}O_6$) suture was placed through the split-thickness of the tunica albuginea in principles of inverted stitch burying-knot technique on the opposite side of the curvature (Figure 2). It is composed of poliglecaprone 25, which is a copoly-

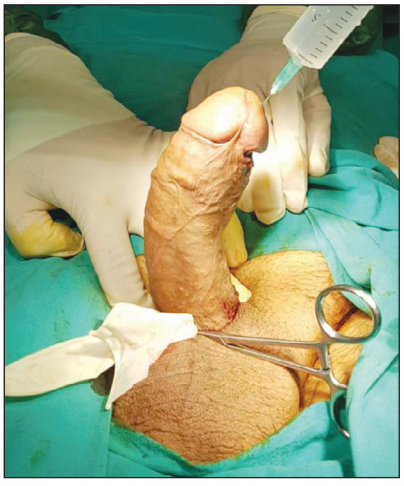

FIGURE 1: Left lateral penile curvature.

mer of glycolide and epsilon-caprolactone. It comes both dyed (violet) and undyed (clear) and is an absorbable monofilament suture. After closing the suture line with Dartos fascial tissue, we placed proximal tourniquet and obtained artificial erection with saline injection again. Penis was completely straight on visual inspection (Figure 3). After it was seen that adequate recovery was achieved, the penis was washed with gentamicin and the subcutaneous and skin tissues were closed with 2 layers of absorbable sutures. In order to prevent urinary retention in the post-operative period, 16-18F foley catheter was kept in the bladder and the procedure was terminated by wrapping the penis with a medium pressure bandage. Foley catheters of the patients were removed on the first postoperative day. Patients were discharged on the first postoperative day, after daily wound dressing was recommended. At the end of the first week, they were invited to the clinic to check for possible wound infection. All patients were informed not to have sexual intercourse for a minimum of 6 weeks in the postoperative period.

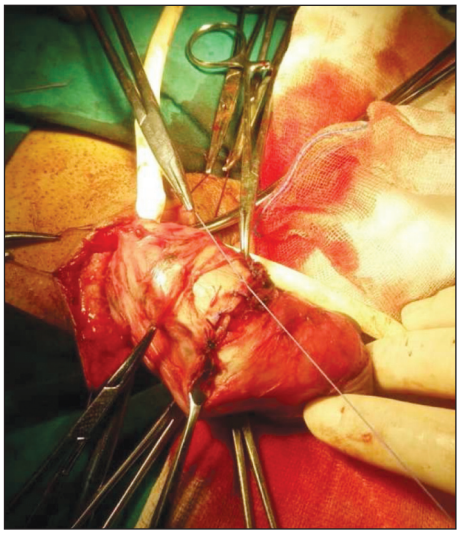

FIGURE 2: Penile plication with monofilament poliglecaprone-25 suture.

FIGURE 3: Full straightened penis after plication.

For the long-term results, patients were invited to the clinic by telephone calling obtained from our hospital's electronic data system and evaluated about the curvature recurrence during rigid erection. Penile erection was obtained by using 30 mg intracavernous papaverine injection and the curvature degree and the penile length was measured with a goniometer or ruler at 18th month. In addition, at the 18th month follow-up, patients were evaluated in terms of postoperative IIEF-5 scoring, presence of palpable suture knots and questioned about satisfaction with the surgery as very satisfied, moderately satisfied or dissatisfied.

STATISTICAL ANALYSIS

All statistical analyses were performed using the SPSS 24.0 (IBM Corp. Chicago) software for Windows. Median, minimum, maximum, percentage values and mean±standard deviation were used to define the variables.

RESULTS

The median age of the patients was 26 (16-72) years and median follow up was 68 (16-120) months (Table 1). Preoperative median curvature degree was 35 (20-60) and the mean penile length was 14.5±2.2 cm. All of the patients were curvature free at the end of the operation. There were no early complications such as wound infection, hemorrhage or urethral damage. None of the patients had erectile dysfunction in postoperative period. Penile straightening was excellent in 40 (83.3%) patients and was good with less than 15 degrees of residual curvature in 5 (10.4%) patients.

TABLE 1: Characteristics of the patients.

Age, years, median (range)	26 (16-72)
Preoperative curvature, degree, median (range)	35 (20-60)
Preoperative penile length, mean±SD, cm	14.5±2.2
Preoperative IIEF-5 score, (0-25), median (range)	23 (17-25)
Operation time, minutes, mean± SD	38.04±16.08
Follow-up, months, median (range)	68 (16-120)
Curvature type, n (%)	
Ventral	29/48 (60.4%)
Dorsal	11/48 (22.9%)
Left lateral	5/48 (10.4%)
Right lateral	3/48 (6.2%)

Only 3 (6.1%) had curvature recurrence >15 degree. Postoperative mean penile length was found to be 14.3±2.0 cm. In the postoperative period, the median IIEF-5 score of the patients was found to be 22 (17-25), and no patient complained of severe erectile dysfunction. Of the patients, 16 (33.3%) had penile shortening without functional problems. While there were no palpable suture knots in 45 (93.75%) of the patients, the palpable suture knot was detected in only 3 (6.2%) patients. Thirty eight (79.2%) of the patients were very satisfied with the result (Table 2).

DISCUSSION

Despite the high success rates reported, one of the most important problems in CPC surgeries is complications secondary to non-absorbable sutures used for plication.[9] In addition, in some cases, plication sutures can be directly palpated without granulomatous reaction, which can cause psychosexual problems in the patient.[10] Penile shortening, penile pain and penile numbness are other important postoperative complications.[11] Since it was first defined by Nesbit in 1965, more minimally invasive methods have been developed to reduce such complications, and for this purpose, the technique of transversely closing the longitudinal incision made to the tunica albuginea without removing the ellipsoid piece has been defined by Yachia.[12] The tunical plication technique, which was described by Essed-Schroeder without tunical incision, was modified by Gholami and Lue, and the 16-dot plication technique was developed to reduce penile shortening and irritative symptoms.[6] As a result, in penile plication surgery, better preservation of the integrity of the tunica albuginea and minimization of NVB damage was achieved and the complications aforementioned were reduced to a certain extent.

TABLE 2: Postoperative results of the patients.

Full straightening, n (%)		40/48 (83.3%
Residual curvature (<15 degree), n (%)		5/48 (10.4%)
	5 degree	2/48 (4.16%)
	10 degree	1/48 (2.08%)
	12 degree	1/48 (2.08%)
	14 degree	1/48 (2.08%)
Recurrence of curvature (>15 degree), n (%)		3/48 (6.2%)
	25 degree	1/48 (2.08%)
	28 degree	1/48 (2.08%)
	35 degree	1/48 (2.08%)
Penile shortening, n (%)		16/48 (33.3%)
Postoperative penile length, mean±SD, cm		14.3±2.0
Palpable suture knot, n (%)		3/48 (6.2%)
Postoperative IIEF-5 scores(0-25), median(range)		22 (17-25)
Postoperative satisfaction, n (%)		
Very satisfied		38/48 (79.2%)
Moderately satisfied		6/48 (12.5%)
Dissatisfied		4/48 (8.3%)

Although the complications have been reduced to a certain extent, the presence of palpable suture knots or granulomas in the plication area in the postoperative period in both the 16-dot plication method and the modified Nesbit procedure emerges as a serious problem.[13] Therefore, more minimally invasive surgical methods have begun to be used today to reduce both suture-related complications and the other complications secondary to plication.[14] In some recent studies, use of the absorbable sutures at CPC surgery has been suggested to avoid certain complications of non-absorbable sutures.[15] Van der Horst C et al. reported the results of their plication surgery in 55 patients using two different elastic nonabsorbable sutures.[16] Accordingly, 37 (67.27%) of the patients in the postoperative period felt suture material, 13 (23.63%) patients were uncomfortable with this condition, and 4 (7.27%) patients had painful erections. In another study with 35 adult patients by Basiri et al. absorbable sutures were used for plication in 17 (48.57%) patients, while nonabsorbable sutures used in 18 (51.42%) patients.[17] According to this study, while palpable sutures were detected in 7 (38.88%) patients in nonabsorbable group in the postoperative period, it was detected in only 1 (5.88%) patient in absorbable group. In our study, we also used the absorbable 3-zero poliglecaprone-25 sutures for plication of tunica albuginea. Long-term success and patient satisfaction rates were really high (91.7%). Similar to the literature palpable suture knot was detected in only 3 (6.2%) patients. Penile shortening was the most common finding seen in 16 (33.3%) patients which did not affect their sexual activity. In addition, none of the patients had serious erectile dysfunction complaints in the postoperative period, and IIEF-5 scores were found to be quite high.

Recurrence of the curvature does happen probably due to early suture breakage or from tissue cut-through. However, the absorbable poliglecaprone-25 is expected to be absorbed at about 12-18 weeks which is enough for stabilizing the plication. Both its monofilament structure and its low potential for tissue reaction can be considered as another important advantages of poliglecaprone-25 suture. In another study, Ozkuvancı et al. reported that they detected a high rate of curvature recurrence in the postpubertal period in 13 patients who underwent plication surgery using nonabsorbable sutures in the prepubertal period.[18] According to this study, amazing high rate of curvature recurrence ranging from 30 to 50 degrees in 7 (53.84%) of the patients was reported in the postpubertal period. Yachia stated about this study that the nonabsorbable suture used for plication may cause cuts on the edge of the plication during rigid erection in the postpubertal period and this may also take a role in high recurrence rate.[19] According to this result, the elastic structure of the poliglecaprone-25 suture we used can be considered as another important advantage. Due to its elastic structure, it is likely that the risk of rupture during erection and the risk of recurrence by cutting the edge of the plication was lower. At the end of the study, it was observed that we achieved very high total patient satisfaction rates.

LIMITATIONS

The most important limitation of our study is its retrospective nature. In addition, lack of penile pain and penile numbness data can be considered as other limitations. Another important limitation is that post-operative evaluation of patient's satisfaction was not performed with a validated questionnaire form due to its retrospective nature. On the other hand, the absence of a control group is an important limitation.

CONCLUSION

The use of poliglecaprone-25 suture in CPC surgeries provides high success and patient satisfaction rates. Postoperative palpable suture knot presence and curvature recurrence were significantly reduced with the use of poliglecaprone-25 suture.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Kubilay Sarıkaya, Ömer Faruk Bozkurt;* ***Design:*** *Kubilay Sarıkaya, Çağrı Şenocak, Fahri Erkan Sadioğlu;* ***Control/Supervision:*** *Çağrı Şenocak, Ömer Faruk Bozkurt;* ***Data Collection and/or Processing:*** *Kubilay Sarıkaya, Fahri Erkan Sadioğlu, Mehmet Çiftçi;* ***Analysis and/or Interpretation:*** *Çağrı Şenocak, Fahri Erkan Sadioğlu, Mehmet Çiftçi;* ***Literature Review:*** *Kubilay Sarıkaya, Çağrı Şenocak;* ***Writing the Article:*** *Kubilay Sarıkaya;* ***Critical Review:*** *Çağrı Şenocak, Ömer Faruk Bozkurt;* ***References and Fundings:*** *Kubilay Sarıkaya;* ***Materials:*** *Kubilay Sarıkaya, Mehmet Çiftçi.*

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