KOREKCIA BIPLANÁRNYCH ZAKRIVENÍ PENISU U PACIENTOV S PEYRONEHO CHOROBOU. POPIS MODIFIKÁCIE EGYDIOVEJ TECHNIKY S NALOŽENÍM SUTÚRY PRIAMO NA MATERIÁL BOVÍNNEHO PERIKARDU

CORRECTION OF THE BIPLANAR PENILE DEFORMITIES IN PATIENTS WITH PEYRONIE'S DISEASE. DESCRIPTION OF THE MODIFIED EGYDIO'S TECHNIQUE WITH ADDITIONAL SUTURE PLACEMENT DIRECTLY ON THE BOVINE PERICARD PATCH

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Došlo: 21. 1. 2016
Přijato: 9. 3. 2016

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Conclicts of interest: The authors declare that they have no competing financial interests.

Authors contributions: Protocol/project development: Peter Weibl and Ralph Herwig. Manuscript writing Peter Weibl and Ralph Herwig. Data analysis: Ralph Herwig and Peter Weibl. Both authors have contributed equally to the study.

SUMMARY

Weibl P, Herwig R. Correction of the biplanar penile deformities in patients with Peyronie's disease. Description of the modified egydio's technique with additional suture placement directly on the bovine pericard patch.

Aim: The objective of this study is to analyze the outcomes of the modified Egydio procedure based on geometric principles in the selected subset of patients with biplanar penile deformities based on Peyronie's disease.

Material and methods: A total of 91 patients with penile deformity underwent surgery between

January 2012 and October 2015. The mean patient's age was 51.5 years. A biplanar curvature was identified in 19 patients. Nine patients were eligible for the final analysis, who were operated with modified Egydio technique using bovine pericard graft (with additional suture placement directly on the graft in order to correct the remaining curvature).

Results: After a median follow-up period of 14 months (range: 12–20 months), no rejection of the graft was observed. Minor residual curvature (less than 15°) that did not interfere with the sexual intercourse, was observed in 2 patients (3/6 months after the surgery). In almost all patients, the intraoperative artificial erection had shown a complete correction of the penile curvature (except for one with residual minor curvature <15, that resulted in haematoma over the pericard graft – 6 months after the primary operation). Mild glans hypoesthesia was reported by three patients. Although lasting for 6 months, it did not represent any cause of dissatisfaction. No new erectile dysfunction was observed.

Conclusion: We have demonstrated favourable outcomes, however in a very small subset of patients with biplanar deformities caused by Peyronie's disease. An additional suture placement directly on the pericard graft did not result in a higher complication rate. According to our preliminary results we presume, that our modification seems to be a safe procedure. Nevertheless, further studies tested on a larger patient's scale with longer follow-up are needed.

KEY WORDS

Peyronie's disease, penile deformity, penile curvature, bovine pericard patch, penile reconstruction.

ABSTRAKT

Weibl P, Herwig R. Korekcia biplanárnych zakrivení penisu u pacientov s Peyroneho chorobou. Popis modifikácie egydiovej techniky s naložením sutúry priamo na materiál bovínneho perikardu.

Cieľ: Cieľom štúdie je analyzovať výsledky modifikovanej techniky podľa Egydia založenej na geometrických princípoch v skupine pacientov s biplanárnou kurvatúrou penisu na podklade Peyroneho choroby.

Materiál a metódy: Z celkového súboru, 91 pacientov podstúpilo chirurgický zákrok pre s kurvatúru penisu v rozmedzí január 2012 a október 2015. Priemerný vek pacientov bol 51,5 rokov. Biplanárny nález deformity bol zaznamenaný u 19 pacientov. Deväť pacientov bolo vyselektovaných za účelom podrobnejšej analýzy, ktorí boli operovaní modifikovanou technikou podľa Egydia s použitím bovínneho perikardu (s následnou sutúrou naloženou priamo na materiál perikardu za účelom korekcie reziduálnej kurvatúry).

Výsledky: Počas priemernej doby odsledovania 14 mesiacov (interval: 12–20 mesiacov) sme nezaznamenali žiadnu rejekciu implantátu. Minimálne reziduálne zakrivenie penisu (menej ako 15°) sme zaznamenali u dvoch pacientov, ktoré však nekompromitovalo sexuálnu funkciu pacienta (3/6 mesiacov po chirurgickom výkone). Takmer u všetkých pacientov bola zaznamenaná ideálna korekcia zakrivenia penisu peroperačne (s výnimkou jedného pacienta s reziduálnou kurvatúrou <15°, s následným nálezom vytvorenia hematómu v priestore nad implantovaným perikardom 6 mesiacov po primárnom zákroku, avšak nebola dôvodom celkovej nespokojnosti).

Záver: Napriek tomu, že sa nám podarilo dosiahnúť priaznivé výsledky, boli preukázané na veľmi malom súbore pacientov s biplanárnou deformitou penisu na podklade Peyroneho choroby. Dodatočná sutúra naložená priamo na materiál bovínneho perikardu neviedla k vyššiemu počtu komplikácií. Na základe predbežných výsledkov možno konštatovať, že uvedená modifikácia sa zdá byť bezpečnou metódou. Avšak sú potrebné ďalšie štúdie na väčšom súbore pacientov s dlhšou dobou sledovania.

KĽÚČOVÉ SLOVÁ

Peyroneho choroba, deformita penisu, zakrivenie penisu, bovínny perikard, rekonštrukcia penisu.

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INTRODUCTION

Tunical lengthening procedures with grafting are indicated in patients with severe penile length loss, curvatures greater than 60°, prominent hourglass deformities and complex penile deformities with the high risk of penile shortening when corrected by the means of plication procedure only (1). Generally penile angulation is responsible for the sexual dysfunction, pain during the intercourse as well as severe psychological traumata. Medication treatments are also unpredictable and in cases of complex deformities rather non-effective (2). Moreover, the effects of the minimally invasive procedures such as lasers and local infiltrations directly into the plaque are equivocal with regard to the long term effectivity (3, 4). Although recent reports on Clostridium collagenase application seem promising, there is a strong need to define the eligible candidates, because of the persistent lack of general understanding of the complexity of Peyronie's disease origin (5, 6, 7). That is why, surgical correction is often required in order to obtain a functionally and cosmetically normal penis. Nonetheless, the "victims of the Peyronie's disease" (PD) usually tend to regain their self-esteem and a new stronger status of masculinity after successful procedure. For more complex cases as mentioned above, by using a grafting technique, the shortening of the penis can be avoided. Herein, we report on the small cohort of patients with biplanar deformity caused by PD using Egydio technique (8,9), modified by additional suture placement directly on the patch, in order to correct the residual curvature.

MATERIALS AND METHODS

Preoperative assessment included personal/medical history, physical examination, assessment of erectile function with the administration of the International Index of Erectile Function 5 (IIEF-5) questionnaire, "selfies" (photographs of the penis in erect state – anterio-posterior and lateral view, in order to document the degree and direction of the deformity) and Doppler ultrasound of the penis. In 3 cases, the self-images were not conclusive, therefore we performed and artificial erection in ambulatory setting before planning for the final procedure. Stretched penile length was recorded pre- and postoperatively. Surgical complications, cosmetic outcome, sexual function, patient satisfaction and postoperative erectile function were assessed postoperatively at 3 months, 6–9 months and 1 year thereafter ("phone call questions interview"). In all patients with an IIEF score of less than 15 and a dynamic echo colour Doppler ultrasound scan to evaluate the degree of penile deformity and the peak systolic velocity in the cavernosal arteries was indicated. A peak systolic velocity (PSV) of less than 35 cm s^{-1} was the exclusion criterion. The patients with such values were counselled against undergoing the operation and offered penile prosthesis implantation. The final indication for surgery was based upon the proposed guidelines on penile curvature (10, 11). Patients from the study cohort had a stable disease for at least 9–12 months, prior to the surgical procedure. A detailed preoperative information concerning procedure expectations, complications and treatment course was shared with the patients. An informed consent was obtained finally from each candidate. Additionally, patients were offered the foreskin-sparing approach. All candidates who decided not to undergo circumcision, where fully informed about the possible complications.

The surgical procedure included plaque incision with partial excision and grafting according to the geometrical principles described by Egydio et al (8, 9). As a graft material we used bovine pericard graft in all 9 cases (Supple Peri-Guard 6x8 cm, Synovis Surgical Innovations, W. St. Paul, MN, USA). If some degree of deformity persisted after the induction of a artificial erection perioperatively (after graft placement), we decided to place additional sutures directly on the graft with regard to the geometrical principles.

Patients were discharged from the hospital on the postoperative day 1 and recommended to refrain masturbation or sexual intercourse for 6 weeks. Erection was assessed postoperatively

("using selfies") at 3 to 6/9 to 12 months postoperatively.

DESCRIPTION OF THE TECHNIQUE

As already established and described by Egydio et al. previously (8, 9), the penis was degloved using a circumferential subcoronal incision and an artificial erection (21 gauge needle with subsequent saline solution infiltration into cavernosal body) was induced to assess the degree of deformity and the point of maximal curvature (Fig. 1A). At this point, an accurate dissection of the Buck's fascia paraurethrally was made. Then the neurovascular bundle was mobilized with blunt/sharp dissection to the midline of the dorsal convex side of the penis. An artificial erection was induced by intracavernous injection of saline solution using a 21-gauge needle into a cavernous body (through the glans or the lateral side of the cavernous body) again.

Afterwards, an incomplete circumferential double Y incision of the tunica albuginea at the place of hourglass deformity/or point of maximal curvature was made. For dorsal, dorsolateral and lateral curvatures, the incision in the tunica albuginea was made 5mm lateral or almost close to the lateral borders of the urethra. There was no necessity to mobilize the urethra. In two cases of lateral plaque localization, we performed a complete plaque excision (Fig. 1B). A small fragment of plaque has been excised in all cases, in order to remove the area of maximal cicatrisation. With the penis under traction, the size of the defect in the tunica was measured once again in order to re-approve the initial measurement. The defect was covered with a bovine pericardium collagen matrix graft (Supple Peri-Guard 6x8 cm, Synovis Surgical Innovations, W. St. Paul, MN, USA) that was sutured to the tunica albuginea using a continuous 4–0 PDS suture (Fig. 1C). Before grafting, pericardial material was re-hydrated in a 0.9 % saline solution for 5–15 min. The complete straightening of the penis was confirmed intraoperatively with an artificial erection in all patients. In our patients sample, with respect to the residual (dorsal, ventral, contralateral) minor curvature (<30°) we decided to place additional few PDS 4.0 sutures directly on the graft to optimize the curvature (Fig. 1E). Finally, the last artificial erection was induced. We have performed circumcision in 3 patients, for the rest we used foreskin sparing approach.

In one case, we had to place additional STAGE sutures to obtain the straight penis (Fig. 1D). With regard to the STAGE technique (12), we performed an eliptical superficial incisions (cca 4x3 mm) of the tunica on the contralateral side to the primary pericard sutures (Fig. 1D/F). The newly generated tissue defect was closed with 3–4 absorbable PDS 4.0 sutures in an double crossed introflecting fashion.

At the end of the procedure a gentle compression was applied to the penis, which was elevated and fixed to suprapubic area. Patients were discharged on the postoperative day 1 and recommended to refrain from any form of sexual intercourse for 6 weeks.

RESULTS

Each patient indicated for the surgery had biplanar deformity, compromising the sexual intercourse. There was no need to perform circumcision, because in our cohort we did not observe any foreskin abnormalities. Nevertheless, we have performed foreskin-sparing approach in 6 patients. The remaining three candidates wanted to avoid all the potential risks concerning prepucium-sparing procedure. Perioperatively we found typical hourglass deformity in (6 pts). Macroscopically between the neurovascular bundle on the dorsal aspect of the penis and the plaque, we had found always enlarged perforator veins (with 2–3 mm in largest diameter) in all cases. This finding of potential venous leakage could be responsible for compromising the rigidity of the penis and final overall ED status (13). All plaques were located on the dorsal side of the penis, except for two found on the lateral aspect of the penis. The size of the plaque varied from 1.8x1 cm to 4.5x2.5 cm. None of the patients had history or was presented with

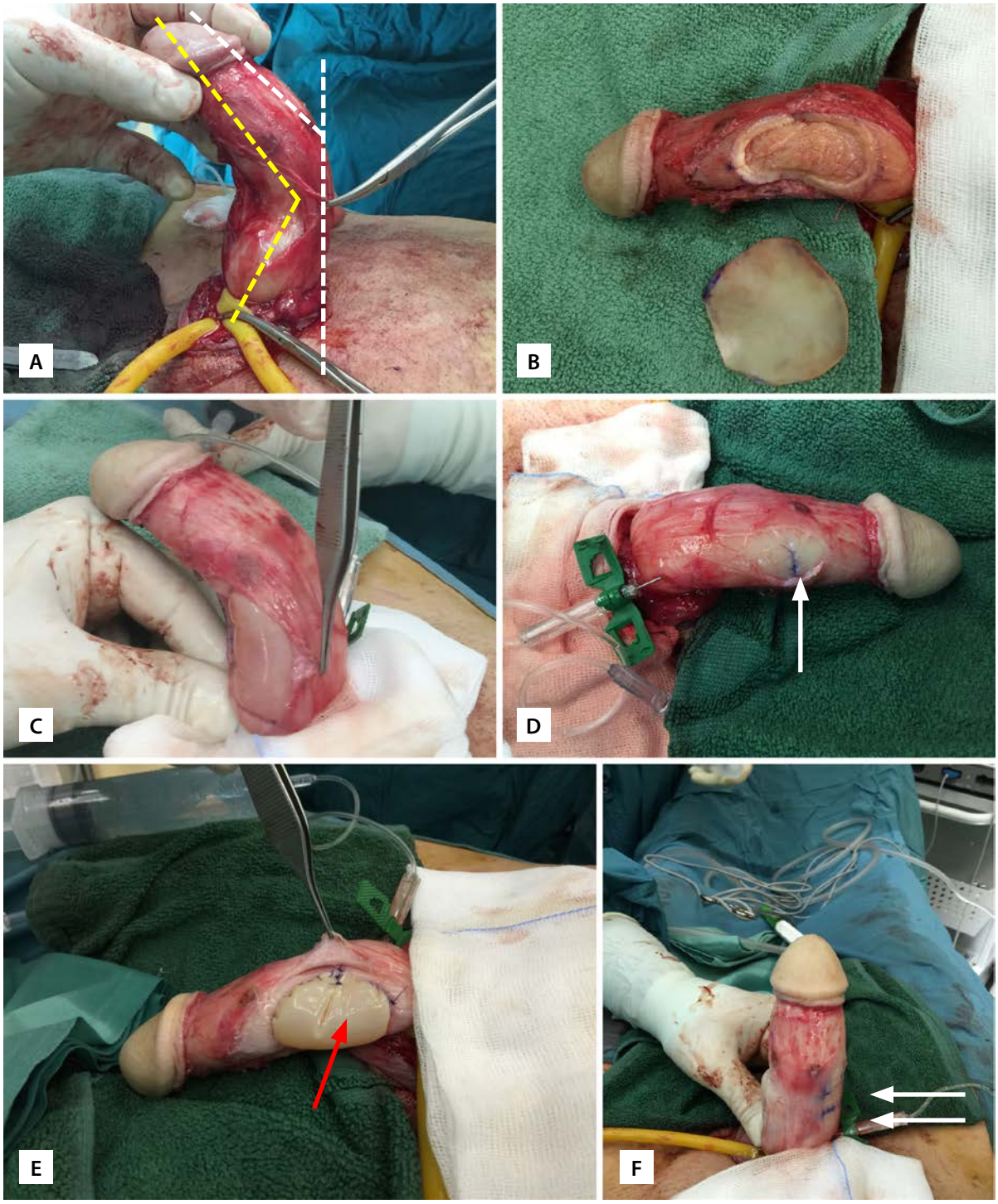

Fig. 1. *Modified Egydio technique for complex penile deformities. A – Biplanar hour-glass deformity (ventral 40° – yellow arrow and lateral deviation to to left 30°). After the plaque incision and partial excision the lateral deviation was corrected (B), however the ventral persisted (C). Additional 2 STAGE sutures – white arrow (D; F); and contralateral pericard patch sutures using PDS 4.0 – red arrow (E). F – final result after artificial erection intraoperatively*

Obr. 1. *Modifikovaná technika korekcie komplexných deformít penisu podľa Egydia. A – Biplanárna „hour-glass" deformita penisu tzv. „tvaru presýpacích hodín" (ventrálne 40° – žltá šípka a laterálne zakrivenie doľava 30°). Po následnej incízii a parciálnej excízii plaku sme zkorigovali laterálne zakrivenie (B), avšak ventrálna deviácia pretrváva (C). Dodatočné nasadenie 2 sutúr podľa STAGE techniky – biela šípka (D, F); a ich kontralaterálne naloženie na materiál perikardu s použitím PDS 4.0 – červená šípka (E). F – definitívny výsledok po peroperačnom navodení arteficiálnej erekcie*

some kind of medical condition impacting the ED status, apart from PD. The duration of operation ranged 85–129 min (median 98 min).

After a median follow-up period of 14 months (range: 12–20 months), no rejection of the graft was observed. Minor residual curvature (less than 15°) that did not interfere with penetrative intercourse was detected 3/6 months postoperatively in 2 patients. In almost all patients, the intraoperative artificial erection showed a complete correction of the penile curvature (except for one case, with a minor 15° curvature persistence) (Fig. 2).

We have observed only one complication. A late onset of hematoma in a patient that already had a sufficient intercourse after the primary procedure. He had noticed some small hardening on the left lateral side of the penis without any penile angulation (6 months postoperatively). Couple months thereafter, he came with 45° unilateral deviation. A redo-surgery was

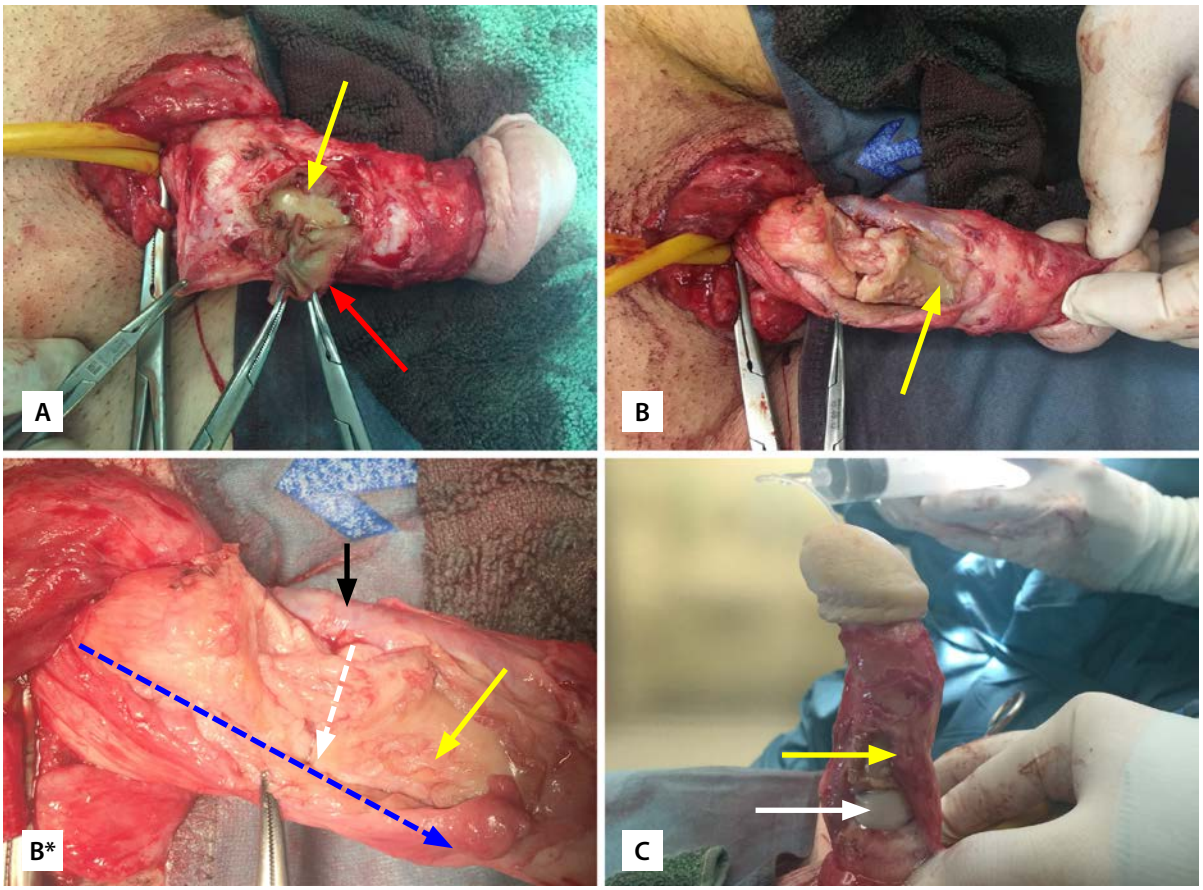

Fig. 2. *Haematoma formation with pseudomembrane (according to the final histology; red arrow) directly over the pericard patch (A), what has led to the new plaque formation and uniplanar lateral deviation with hour glass deformity. That is why, a new plaque incision with partial excision (because wider excision can potentially lead to penile instability) (B/B* – urethra black arrow; incision line – white dashed arrow; lateral part of the neurovascular bundle – blue dashed arrow; previously implanted bovine pericard patch – yellow arrow); followed by grafting with pericard patch (C – white arrow, yellow arrow – previously implanted pericard graft)*

Obr. 2. *Vzniknutý hematóm so pseudokapsulou (verifikovaný histologickým vyšetrením; červená šípka) priamo nad povrchom implatovaného perikardu (A), čo viedlo k novej formácii plaku a uniplanárnej laterálnej deviácii s „hour-glass" deformitou. Preto, bola vykonaná opätovná incízia a parciálna excízia plaku (nakoľko rozsiahlejšia, by mohla viesť k instabilite penisu) (B/B* – močová trubica- čierna šípka; miesto incízie – biela prerušovaná šípka; laterálna časť neurovaskulárneho zväzku – modrá prerušovaná šípka; primárny implantát – žltá šípka); s následnou implantáciou perikardu (C- biela šípka, žltá šípka – primárny implantát perikardu)*

indicated. Intraoperatively, an old haematoma above the pericard graft covered with pseudocapsule (which suprisingly looked exactly like a pericard patch, while final histopathology report confirmed a fibrotic tissue) (Fig. 2A). Underneath the heamathoma a typical hour glass deformity was detected. The primary site of the pericard patch implantation remained intact (Fig. 2B/B*). Finally, we corrected the deformity by means of a new bovine pericard implant (Fig. 2C), we do not think, that the primary additional pericard sutures were the cause of the haematoma formation. On the other hand, neither we can exclude it, to be quite frank. Nevertheless, 6 months after the primary surgery the PDS 4.0 sutures were completely resorbed, so logically one would expect any kind of haemorrhage during the early phase of the postoperative follow-up.

Mild glans hypoesthesia was reported by three patients lasting for 5–9 months and posing no cause of dissatisfaction. Overall, the median gain in penile length was 1.3 cm (range: 1.2–2.5 cm), and the median postoperative IIEF-5 score showed a significant improvement, increasing from the preoperative 16.0 (range: 15.0–21.0) to 18.5 (range: 17.0–23.0) 6–9 months postoperatively. At that time all patients were able to have normal sexual intercourse, three patients required phosphodiesterase type 5 inhibitors to obtain more satisfactory rigidity. No newly developed erectile dysfunction appeared in these patients. None of the patients opted for further surgical correction.

DISCUSSION

The plication/corporoplasty procedures are indicated in patients with sufficient erectile function with uniplanar curvatures < 60° without hour-glass/hinge deformity. These techniques are also suitable for candidates in whom the predicted loss of penile length is < 20%. Incision and grafting are reserved for complex deformities with destabilizing features. Finally, penile prosthesis insertion is the treatment of choice in PD patient with ED and non-responders to phosphodiesterase-5inhibitors. (10, 11, 14). Prior to surgery, each patient has to undergo a comprehensive counseling. All potential goals, patient's expectations as well as complications should be discussed with the patient. A detailed informed consent is a "sine qua non" before the procedure.

Bovine pericard allograft is commonly used material for incision and grafting procedure with low complication rates (14), which is partially, due to its optimal mechanical properties (15). Reports, using Egydio technique showed satisfactory results achieving almost 90% of successfull corrections with regard to the short and mid term follow up (8, 16, 17).

To our knowledge, this is the first report describing such a modification. We are fully aware, that the complete correction can be probably obtained almost in all cases by means of Egydio technique solely. However, we suppose that for the cases of minor persistent residual curvature, our proposed technique can be a safe alternative and accordingly we decided to correct the residual deviation using plication of the pericard. In one case, we made a failure in the final measurement, which resulted in additional contralateral placement of the "STAGE" sutures (Fig. 2). The "STAGE" technique, consists of superficial tunica albuginea excisions according to geometric principles. This procedure has been proven as a safe and valid alternative for the treatment of congenital ventral, dorsal, dorso-lateral or ventro-lateral curvature of the penis with regard to the short and long-term follow up (9, 12).

Our findings showed a low complication rate, in a rather small cohort of patients, with a relatively short term follow up. The median gain in penile length was 1.3 cm in our study, which is comparable to the previous reports on plication and grafting procedures (8, 16, 17). After a median follow up of 14 months all patients reported satisfactory erections sufficient for sexual intercourse. All the partners were satisfied as well. As of this fact, the logical explanation is, that all men had intraoperatively relatively small plaques, mostly located mostly on the dorsal aspect of the penis (only 2 pts dorsolateral), which corresponds with the favourable final outcome (17). Some disturbing

reports showed relatively high rates (15–61%) of impaired erectile function (EF) postoperatively in the group of patients with leghtening and grafting procedures (18, 19, 20). None of our patients took medication for EF preoperatively, what had been proven to be a positive prognosticator (21, 22). With respect to our short term findings, we have demonstrated high satisfactory rates. Even in uncircumcised men, we did not observe any bothering complications. What supports the current view on prepucium preservation in patients undergoing penile degloving procedures. The mandatory is to identify the avascular plane beween dartos and Buck's fascia. Generally, the overall complication rate is less than 1%, as presented by Garaffa et al. in the largest study (of 113 not circumcised patients) to date. The risk of prepucial adverse events is higher in patients with previous degloving operations and phimosis (23).

Nevertheless, longer follow up is mandatory, because recurrence of curvature or new onset of ED are not uncommon sequelae within a time frame of 5 years (24). Therefore, true rates of penile shortening and ED after the surgery are generally difficult to estimate. To our knowledge, there are no studies comparing the surgical outcomes with the controls. What makes to extrapolate the outcome data into the general PD patient's population after surgery slightly obscure. The extrapolation of the outcome data into the general PD patients´ population is still slightly obscure. Surgery remains the mainstay of PD treatment for complex deformities. Until the true nature of mechanism by which PD develops remains unclear, it will be difficult to optimize the patient's management and final outcome. Understanding the mechanical aspects of PD and the reason why, the disease tends to progress pose the crucial factors for the future multimodal treatment approach.

We believe that our modification can be an optional and acceptable enhancement of the current surgical knowledge. However, one of the major limitation is the small patient sample. That is why we did not perform any statistical analysis and clinicians should take our results with caution until proven otherwise in a larger patients population with at least moderate follow up.

CONCLUSION

We have demonstrated favorable outcomes in a very small subset of patients with biplanar deformities in conjunction with the Peyronie's disease. An additional suture placement directly on the pericard graft did not result in a higher complication rate. According to our preliminary results we presume, that our modification seems to be a safe procedure. Nevertheless, it has to be further tested on a larger patient's scale with longer follow-up.

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