Surgical Treatment of Peyronie's Disease: Systematic Review of Techniques Involving or Not Tunica Albuginea Incision

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ABSTRACT

Introduction: Peyronie's disease is characterized by abnormal healing of the tunica albuginea (TA), resulting in the production of a fibrotic plaque that leads to penile curvature and considerable psychological impact. Precise knowledge of various surgical techniques is of fundamental importance for proper management of the patient.

Aim: To compare results (including surgical success on quality of life and sexual satisfaction and complications) between 2 different techniques: with TA incision vs without TA incision.

Methods: The search was performed according to PRISMA in PubMed and Embase through September 2018. Key words searched were ["Peyronie" or "Peyronie's disease" or "penile curvature" or "penile induration"] and ["technique" or "surgery" or "surgical"] and ["quality of life" or "sexual quality of life" or "sexual satisfaction" or "outcome" or "outcomes"].

Main Outcome Measure: Thirty-one articles were considered for this review. The main outcomes were reported descriptively.

Results: The most significant results included penile straightening (88.5% vs 70.9% favoring not opening TA), perception of a palpable nodule (13.2% vs 27.4% favoring not opening TA), and loss of sensibility (11% vs 20% favoring not opening TA). Neither a prospective randomized study nor a direct comparison study has been performed for these techniques. There is no consensus among the studies on how to measure results. Subjective criteria were primarily used for evaluation, and there is a paucity of objective tools to quantify the outcomes.

Conclusion: There is no consensus on which technique achieves better results or fewer complications; therefore, the decision on which technique to use is a matter of surgeon preference. Studies comparing distinctive techniques and either opening or not opening the tunica albuginea should be performed to support surgical decision making. In addition, guidelines that could assist in the standardization of criteria should be investigated in future studies, with the aim of better evaluating outcomes. **Barbosa, ARG, Takemura LS, Cha JD, et al. Surgical Treatment of Peyronie's Disease: Systematic Review of Techniques Involving or Not Tunica Albuginea Incision. Sex Med Rev 2020;8:324–332.**

Key Words: Peyronie's Disease; Penile Curvature; Penile Induration; Technique; Tunica Albuginea; Sexual Health

INTRODUCTION

Peyronie's disease (PD) is characterized by an abnormal healing process of the tunica albuginea resulting in a fibrotic plaque on the body of the penis.[1] This mechanism is secondary to a local inflammatory response, possibly triggered by local trauma during intercourse. The inelastic plaque that forms leads to penile deformity, interfering with sexual intercourse.[2–5] The global prevalence is approximately 5% (range 3–16%).[6,7] Prevalence is higher in men with diabetes mellitus (DM) and erectile dysfunction (ED), and the peak incidence of PD is around the fifth decade of life.[8–11]

PD involves 2 distinct and sequential phases that define the ideal time and type of treatment. In the active (acute) phase, fibrotic plaque formation occurs, promoting progressive penile deformity and pain. The stable (chronic) phase occurs over time and is characterized by plaque stabilization, which also allows stabilization of the deformity and resolution of pain.[12,13] Treatment of PD varies according to the stage and degree of deformity, as well as by the impact on the patient. Surgical treatment is indicated when there is a considerable impairment in sexual activity[14] in the stable phase.[4,5,15,16]

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Numerous surgical techniques have been described, with varying complexity. Plicature techniques and their variants—with or without tunica albuginea opening—are reserved for cases in which there is a low angulation curvature with normal penile length, as these techniques tend to reduce penis length and are less effective in larger curvatures. Techniques with grafts are reserved for more complex cases, with higher degree curvatures or in cases when penile shortening is a problem. Finally, penile prosthesis is the choice for cases in which there is considerable ED refractory to clinical treatment.[17–21]

In the present review, we focused on surgical management of PD through techniques with or without opening the tunica albuginea, excluding grafts and prostheses. Techniques without opening the tunica albuginea are represented by the plicatures proposed by Essed and Shröder, and techniques that open the tunica include that described by Nesbit in which a segment of tunica albuginea is resected and a sequential closure of the opening is performed, as well as the Yachia technique, which involves longitudinal incisions and suture in a perpendicular direction.[1,2,4,5,12,15,16,22]

OBJECTIVE

The present review aims to compare results (including surgical success, quality of life, sexual satisfaction, and complications) of 2 different surgical approaches: tunica albuginea incision vs no tunica albuginea incision.

METHODS

The search was performed in Medline and Embase up to September, 5, 2018, according to the standards set by PRISMA, without restriction of initial date. Key words searched were ["Peyronie" or "Peyronie's disease" or "penile curvature" or "penile induration"] and ["technique" or "surgery" or "surgical"] and ["quality of life" or "sexual quality of life" or "sexual satisfaction" or "outcome" or "outcomes"].

Data extraction was performed by two different researchers (A.R.G.B. and L.S.T.) independently. Discrepancies were decided after discussion between both researchers, and if necessary a third researcher (J.D.C.) analyzed discrepancies and determined a consensus. We found 289 articles at PubMed and 597 at Embase, for a total of 886 articles, which included 314 meeting abstracts and 235 duplicated abstracts, reducing the total number of articles to be further analyzed to 337. Exclusion criteria were non-human studies, studies not related to PD or quality of life, studies not related to surgical treatment, and articles not in English. Studies involving grafts or prosthesis techniques were also excluded from this review.

For the present review, we evaluated cohorts of patients with PD treated with tunica albuginea incision (Nesbit, Yachia) and without tunica albuginea incision (plication, 16-dot plication). At the end of selection process, 29 articles were considered (Figure 1). Outcomes analyzed included success rate (ie, quality of life, sexual satisfaction, capacity of penetration, erection, and improvement in curvature) and complications (ie, erectile

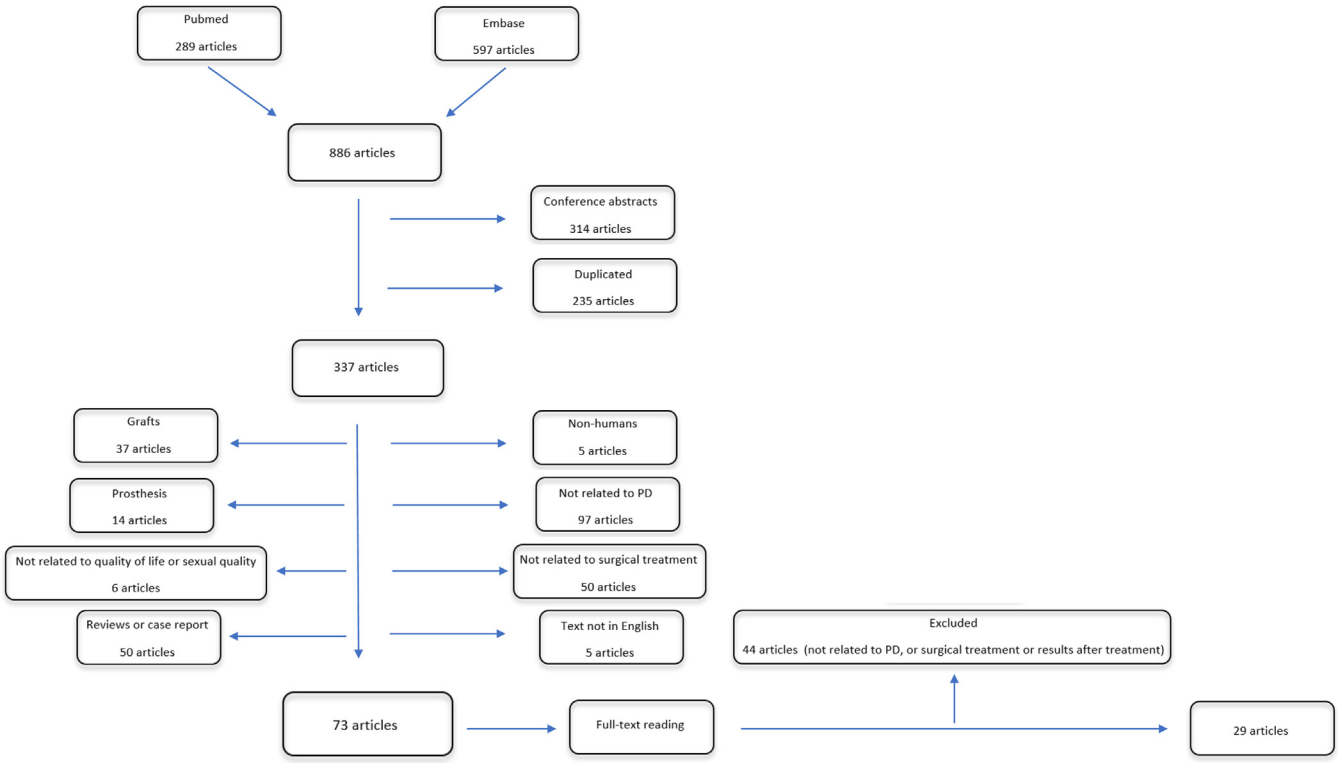

Figure 1. Flowchart of the study search and inclusion criteria.

Table 1. Penile straightening

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	86%	Improvement in curvature
	Seveso et al (2018)[23]	Plicature	187	92%	Complete correction of curvature
	Kim et al (2008)[30]	Plicature	26	65%	Satisfactory straightening
	Levine and Lenting (1997)[24]	Plicature	22	91%	Complete correction of curvature
Total			263	88.5%	
Opening	Savoca et al (2004)[25]	Nesbit	218	86.3%	Complete correction of curvature
	Rolle et al (2005)[48]	Nesbit	18	100%	Complete correction of curvature
	Porst et al (1985)[26]	Nesbit	4	75%	Complete correction of curvature
	Paez et al (2007)[29]	Plicature	76	42.1%	Correction of curvature
	O'Donnell (1992)[27]	Nesbit	13	75%	Complete correction of curvature
	Lopes et al (2013)[28]	Yachia	112	50.9%	Complete correction of curvature
	Kueronya (2015)[32]	Nesbit	50	79.2%	Improvement in curvature
Total			491	70.9%	

dysfunction, palpable nodule, pain, and residual curvature). This review is registered with the International Prospective Register of Systematic Reviews (ID CRD42018106338).

RESULTS

Correction of Penile Curvature

Complete penile curvature correction was obtained in more than 90% of cases without TA opening (w/oTAo),[23,24] and studies involving techniques with TA opening (wTAo) had success rates ranging between 42% and 86%.[25–29] Patient satisfaction with curvature improvement ranged from 65%[30] to 86%[31] after w/oTAo techniques, whereas a satisfaction rate of 79.2% after wTAo techniques has been reported.[32] Table 1 summarizes penile curvature correction outcomes. The mean success rates for w/oTAo vs wTAo techniques were 88.5% and 70.9% for 263 and 491 men, respectively. Criteria used to define penile curvature correction varied between studies. We considered curvature correction to be satisfactory if there was complete correction (most frequent), satisfactory straightening, or improvement in curvature.

Improvement in Quality of Life and Sexual Satisfaction

Quality of life improved 44–94% for w/oTAo techniques[23,30,31,33–39] and 78–100% for wTAo techniques.[25,26,28,39,40] Quality of life improvement was observed in 76.3% and 85.5% of 610 and 408 men, respectively, for w/oTAo vs wTAo techniques. Table 2 summarizes findings related to improvement in quality of life and sexual satisfaction outcomes.

Table 2. Quality of life and sexual satisfaction

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	78%	Moderate to very satisfied
	Chahal et al (2001)[33]	Essed-Schroeder	44	52%	Surgery recommended
	Chung et al (2014)[34]	Plicature	118	94%	Satisfied (among all types of curvatures)
	Fazili et al (2007)[35]	Plicature	78	71%	Satisfied (in 5 years)
	Geertsen et al (1996)[36]	Plicature	28	82%	Very satisfied and satisfied
	van der Drift et al (2002)[37]	Essed-Schroeder	31	58%	Satisfied
	Taylor and Levine (2008)[38]	Plicature	61	82%	Very satisfied and satisfied
	Seveso et al (2018)[23]	Plicature	187	77%	Completely satisfied
	Poulsen and Kirkeby (1995)[39]	Plicature	9	44%	Good and acceptable result
	Kim et al (2008)[30]	Plicature	26	65%	Completely satisfied
Total			610	76.3%	
Opening	Savoca et al (2004)[25]	Nesbit	218	83.5%	Completely satisfied
	Rehman et al (1997)[40]	Nesbit	26	78%	Satisfied
	Poulsen and Kirkeby (1995)[39]	Nesbit	48	91%	Good and acceptable result
	Porst et al (1985)[26]	Nesbit	4	100%	Good and satisfactory result
	Lopes et al (2013)[28]	Yachia	112	88.4%	Completely satisfied
Total			408	85.5%	

Table 3. Capacity of penetration

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	Geertsen et al (1996)[36]	Plicature	118	71%	Capable of sexual activity
	van der Drift et al (2002)[37]	Essed-Schroeder	78	71%	Capable of sexual activity
	Taylor and Levine (2008)[38]	Plicature	28	90%	Capable of sexual activity
	Papagiannopoulos et al (2015)[41]	Plicature	31	93.8%	Capable of sexual activity
	Iacono et al (2012)[42]	Essed-Schroeder	61	94%	Capable of sexual activity
	Kim et al (2008)[30]	Plicature	187	89%	Capable of sexual activity
Total			503	82.5%	
Opening	Shin et al (2016)[43]	Plicature	218	82.4%	Capable of sexual activity
	Paez et al (2007)[29]	Plicature	26	47.7%	Capable of sexual activity
	O'Donnell (1992)[27]	Nesbit	48	83%	Capable of sexual activity
	Mulhall et al (2005)[44]	Modified corporoplasty	4	95%	Capable of sexual activity
Total			296	79.7%	

Improvement in quality of life and sexual satisfaction was rated as completely satisfied, very satisfied, or good and/or acceptable results.

Capacity of penetration

Ability to perform sexual activity after PD correction was maintained or restored in 71–94% of patients w/oTAo[30,36–38,41,42] and in 48–95% of patients undergoing wTAo techniques (mean 82.5%, n = 503 vs mean 79.7%, n = 296).[27,29,43,44] Table 3 summarizes these findings. Penetration capacity was defined as being able to perform sexual activity.

Penile Length

Penile shortening reports after PD surgeries varied largely between studies. A striking report of a 90% shortening rate after surgeries w/oTAo was reported by Chahal et al[33] and van der Drift,[37] whereas rates varying between 3% and 20% were demonstrated in other studies.[23,24,35,38] Among the wTAo studies, there were few in which none of the patients reported shortening,[45,46] but in some only 6% reported shortening,[39] even though most studies demonstrated shortening rates between 25% and 86%.[26,27,32,47–50] On average, penile length was preserved in 39.5% of 684 men w/oTAo vs 43.6% of 337

Table 4. Penile length

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	74%	Penile shortening
	Cantoro et al (2014)[51]	Nesbit and Essed-Schroeder	89	22.5%	Penile shortening
	Chahal et al (2001)[33]	Essed-Schroeder	44	90%	Penile shortening
	Chung et al (2014)[34]	Plicature	118	77.1%	Penile shortening
	Fazili et al (2007)[35]	Plicature	78	3%	Penile shortening
	van der Drift et al (2002)[37]	Essed-Schroeder	31	90%	Penile shortening
	Taylor and Levine (2008)[38]	Plicature	61	18%	Penile shortening
	Seveso et al (2018)[23]	Plicature	187	20%	Penile shortening
	Kim et al (2008)[30]	Plicature	26	69%	Penile shortening
	Levine and Lenting (1997)[24]	Plicature	22	9%	Penile shortening
Total			684	39.5%	
Opening	Yafi et al (2015)[47]	Plicature	14	86%	Penile shortening
	Ahmadnia et al (2016)[45]	Plaque excision with suture	35	0%	Penile shortening
	Darewicz et al (2004)[46]	Plaque excision with suture	16	0%	Penile shortening
	Rolle et al (2005)[48]	Nesbit	18	78%	Penile shortening
	Poulsen and Kirkeby (1995)[39]	Nesbit	48	6.25%	Penile shortening
	Porst et al (1985)[26]	Nesbit	4	25%	Penile shortening
	Papagiannopoulos et al (2017)[49]	Plicature	81	48.2%	Penile shortening
	O'Donnell (1992)[27]	Nesbit	13	67%	Penile shortening
	Licht and Lewis (1997)[50]	Yachia	30	67%	Penile shortening
	Licht and Lewis (1997)[50]	Nesbit	28	37%	Penile shortening
	Kueronya et al (2015)[32]	Nesbit	50	78%	Penile shortening
Total			337	43.6%	

Table 5. Erectile dysfunction

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	10.7%	Incapacity to have sexual relations
	Cantoro et al (2014)[51]	Nesbit and Essed-Schroeder	89	11.3%	Erectile dysfunction
	Chahal et al (2001)[33]	Essed-Schroeder	44	56%	Moderate erectile dysfunction or worsening of erection
	Chung et al (2014)[34]	Plicature	118	11.8%	Incapacity to have sexual relations
	Fazili et al (2007)[35]	Plicature	78	11%	Incapacity of sexual relation
	Geertsen et al (1996)[36]	Plicature	28	28.55	Incapacity of sexual relation
	Taylor and Levine (2008)[38]	Plicature	61	19%	Worsening of rigidity
	Seveso et al (2018)[23]	Plicature	187	15%	Worsening of erectile function
	Poulsen and Kirkeby (1995)[39]	Plicature	9	55.5%	Erectile dysfunction
	Papagiannopoulos et al (2015)[41]	Plicature	114	33.8%	Dissatisfaction with penile rigidity
	Kim et al (2008)[30]	Plicature	26	19%	Loss of rigidity
	Levine and Lenting (1997)[24]	Plicature	22	9%	Incapacity to have an erection
Total			804	19.9%	
Opening	Darewicz et al (2004)[46]	Plaque excision with suture	16	0%	Erectile dysfunction
	Shin et al (2016)[43]	Plicature	22	13.6%	Worsening of erectile function
	Savoca et al (2004)[25]	Nesbit	218	12.9%	Worsening of erectile function
	Papagiannopoulos et al (2017)[49]	Plicature	81	24.7%	Worsening of erectile function
	Paez et al (2007)[29]	Plicature	76	60.5%	Erectile dysfunction
	Licht and Lewis (1997)[50]	Yachia	30	0%	Erectile dysfunction
	Licht and Lewis (1997)[50]	Nesbit	28	4%	Erectile dysfunction
Total			471	20.8%	

men wTAo according to the reported studies (Table 4). Decreased penile length was based on patient-reported penile shortening.

Erectile Dysfunction

Criteria used to evaluate ED were heterogeneous and subjective. Most studies of w/oTAo techniques observed low ED, ranging from 11% to 19%,[23,24,30,31,34,35,38,51] but 2 studies reported higher ED rates of around 56%.[33,39] Among the studies of wTAo techniques, the mean ED rate was 25%,[46,49,50] except for a study reporting a 60% rate of ED[29] and 2 studies that did not observe ED in any patient.[46,50] The mean ED rates for w/oTAo vs wTAo techniques were 19.9% (n = 804) and 20.8% (n = 471) (Table 5). The definitions of erectile dysfunction were not homogeneous among the studies, and no objective definitions could be found. For the purposes of the present analysis we

Table 6. Pain

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	Chahal et al (2001)[33]	Essed-Schroeder	44	16%	Significant pain and discomfort
	Fazili et al (2007)[35]	Plicature	78	26%	Pain in 6 months
	Geertsen et al (1996)[36]	Plicature	28	17.8%	Pain
	van der Drift et al (2002)[37]	Essed-Schroeder	31	26%	Pain
	Seveso et al (2018)[23]	Plicature	187	10.4%	Pain after 4–6 wk
	Kim et al (2008)[30]	Plicature	26	11%	Pain
Total			394	15.7%	
Opening	Darewicz et al (2004)[46]	Plaque excision with suture	16	0%	Pain
	Rolle et al (2005)[48]	Nesbit	18	0%	Pain
	Papagiannopoulos et al (2017)[49]	Plicature	81	4.9%	Pain
	Paez et al (2007)[29]	Plicature	76	27.6%	Pain
Total			191	13%	

Table 7. Palpable nodule

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	3.5%	Palpable granuloma
	Chahal et al (2001)[33]	Essed-Schroeder	44	34%	Palpable granuloma
	Fazili et al (2007)[35]	Plicature	78	3%	Palpable granuloma
	Seveso et al (2018)[23]	Plicature	187	5%	Palpable granuloma
	Kim et al (2008)[30]	Plicature	26	81%	Palpable granuloma
Total			363	13.2%	
Opening	Papagiannopoulos et al (2017)[49]	Plicature	81	19.8%	Palpable granuloma
	Paez et al (2007)[29]	Plicature	76	35.5%	Palpable granuloma
Total			157	27.4%	

defined ED as worsening penile rigidity, unsatisfactory penile rigidity, or reported erectile dysfunction.

Pain

Postoperative pain was reported in 10–26% of the patients in the w/oTAo studies.[23,30,33,35–37] No pain was reported in any patient in 2 wTAo studies,[46,48] but pain was reported in up to 5% of patients in 1 study,[49] and 1 study reported that 27.6% of patients complained of pain.[29] In total, pain complaints were reported by 15.7% (n = 394) vs 13% (n = 191) of patients undergoing w/oTAo or wTAo techniques, respectively (Table 6). The definition of pain was not objective within the studies, as subjective reports of pain after surgery were relied upon.

Palpable Nodule

Palpable granulomas were reported in both types of techniques. In the w/oTAo studies, granulomas were reported in 3–5% of patients,[23,31,35] 34% of patients,[33] and up to 81% of patients.[30] In the wTAo studies, rates between 20% and 35% were reported.[29,49] Palpable nodules occurred in 13.2% (n = 363) and 27.4% (n = 157) of patients undergoing w/oTAo or wTAo techniques, respectively (Table 7). The subjective palpation of a nodule after surgery determined the presence of this complication.

Sensibility

Considering loss of sensibility (mainly in the glans), w/oTAo techniques were reported to have numbness rates varying from 0% to 32%,[23,30,31,33–35,38,51] and rates for wTAo techniques ranged

Table 8. Sensibility

Tunica albuginea	Article	Technique	n	Rate	Criteria
Non-opening	van der Horst et al (2004)[31]	Essed-Schroeder	28	28%	Reduction of penile sensibility
	Cantoro et al (2014)[51]	Nesbit and Essed-Schroeder	89	8.9%	Reduction of glans sensibility
	Chahal et al (2001)[33]	Essed-Schroeder	44	32%	Reduction of glans sensibility
	Chung et al (2014)[34]	Plicature	118	0%	Reduction of sensibility
	Fazili et al (2007)[35]	Plicature	78	3%	Paresthesia of the glans
	Taylor and Levine (2008)[38]	Plicature	61	31%	Reduction of penile sensibility
	Seveso et al (2018)[23]	Plicature	187	8%	Reduction of glans sensibility
	Kim et al (2008)[30]	Plicature	26	19%	Loss of penile sensibility
	Levine and Lenting (1997)[24]	Plicature	22	4.5%	Reduction of penile sensibility
Total			653	11%	
Opening	Yafi et al (2015)[47]	Plicature	14	7%	Reduction of sensibility of glans
	Savoca et al (2004)[25]	Nesbit	218	11%	Reduction of glans sensibility
	Rolle et al (2005)[48]	Nesbit	18	60%	Reduction of glans sensibility
	Rehman et al (1997)[40]	Nesbit	26	19.2%	Reduction of sensibility
	Papagiannopoulos et al (2017)[49]	Plicature	81	22.2%	Reduction of penile sensibility
	Paez et al (2007)[29]	Plicature	76	65.8%	Reduction of penile sensibility
	O'Donnell (1992)[27]	Nesbit	13	0%	Reduction of sensibility
	Lopes et al (2013)[28]	Yachia	112	8%	Reduction of glans sensibility
	Licht and Lewis (1997)[50]	Yachia	30	3%	Reduction of penile sensibility
	Licht and Lewis (1997)[50]	Nesbit	28	14%	Reduction of penile sensibility
Total			616	20%	

from 0% to 65.8%.[25,27–29,40,47–50] Mean rates for w/oTAo and wTAo techniques were 11% (n = 653) and 20% (n = 616), respectively (Table 8). This complication was defined as a report of reduced sensibility in the penis or glans.

DISCUSSION

Consequences of Peyronie's disease include pain, limited penetration ability, and the appearance of palpable plaque. The psychological impact includes depression and anxiety disorders, impaired self-image, and sexual dissatisfaction, resulting in a worsening of the patient's quality of life. Surgical correction offers the possibility of improving this situation.[12]

Several techniques have been proposed to correct PD deformities. Penile prostheses are the first-line option for PD associated with severe erectile dysfunction. Graft techniques are a good alternative for complex or high-grade curvatures. For-low grade curvatures that require surgical management, myriad surgical techniques have been proposed. Plication procedures have been initially proposed as a safe and simple approach. The use of absorbable sutures in these early procedures was associated with failure. In 1965, Nesbit removed ellipses of tunica albuginea with further closure, modifying the concept of simple plication techniques.[18,52–54]

Both these principles have been subsequently improved. Plication techniques avoiding TA incisions and therefore avoiding exposure of the cavernosal tissue have evolved. Essed and Schroeder proposed the utilization of non-absorbable sutures.[55,56] Inversion of plication suture knots was proposed by Knispel et al.[57] In 1997, Rehman et al[40] proposed shaving the TA to induce better scar formation and better adhesion of the plicated tunica, and Lue et al[11,58] proposed combining several plications. Avoiding TA opening could prevent bleeding from corpus cavernosum and damage to the delicate intracorporeal tissue, thus potentially avoiding erectile dysfunction. The procedures that relied on TA opening were further developed by several authors. Non-absorbable sutures have also been utilized. The Heineke-Mikulicz principle has been applied after TA longitudinal incision, as proposed by Yachia,[59] and other techniques such as multiple elliptical incisions and closures have been suggested by Savoca et al.[25,59]

The present systematic review evaluated the outcomes reported in most of the studies: penile straightening, quality of life and sexual satisfaction, penetration capacity, impact on penile size, erectile dysfunction, pain, perception of a palpable nodule, and reduction of penile sensitivity. Our study has some interesting findings. First, we did not find level 1 evidence favoring any technique. No prospective randomized studies nor any direct comparison study has ever been performed comparing these techniques. Additionally, we could not find a standard nomenclature for reporting results. Mostly subjective criteria were used to evaluate outcomes, and there is a paucity of objective tools with which to quantify results. This lack of standardization limits the possibility of comparison among the published data.

Second, the 31 studies included in the present review represent a total of 1707 men. Principles of TA opening vs not opening were almost equally reported in the medical literature (877 vs 830), so apparently surgeons that treat PD currently apply both TA incision and plication techniques. When analyzing the reported outcomes, significant differences were observed for the perception of palpable nodules, which were more evident for wTAo than w/oTAo techniques (27.4% vs 13.2%). The loss of sensibility was more evident for wTAo than w/oTAo techniques (20% vs 11%). However, when evaluating quality of life and sexual satisfaction, wTAo techniques seemed to be more advantageous (85.5% vs 76.3%).

Our study has several limitations. Because there were no prospective randomized studies, it was not possible to perform a meta-analysis. Second, because no study made direct comparisons for the techniques, statistical analyses could not be performed, even though weighted averages were calculated. Although only case series are available in the current literature, a large number of studies were available to be evaluated and specific outcomes compared. The present study should serve as a guideline for establishing objective outcomes for future studies so that further conclusions can be drawn.

CONCLUSION

Several techniques that either involve or do not involve incision to the tunica albuginea have been used to treat the curvature of PD. There is no consensus on which approach achieves better results or fewer complications; therefore, the decision on which technique to use is a matter of surgeon preference. Studies comparing distinctive techniques that either open or do not open the tunica albuginea should be performed to support surgical decisions. In addition, it is important to establish guidelines to assist in standardization of criteria used in future studies, with the aim of better evaluating outcomes.

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