Received: 31 August 2025 | Accepted: 13 October 2025

DOI: 10.1002/uro2.70044

UroPrecision Open Access

REVIEW ARTICLE

Supersonic transporter (SST) deformity of penile prosthesis: Current management strategies

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Abstract

Supersonic transporter (SST) deformity, also known as floppy glans syndrome, represents a persistent source of post-operative dissatisfaction among patients undergoing inflatable penile prosthesis (IPP) implantation. Although infection and mechanical failure rates have declined with advances in device design and surgical technique, SST deformity remains a challenging anatomical complication. It results primarily from inadequate corporal dilation, undersized or malpositioned cylinders, or true glans hypermobility due to disruption or weakness of the corporo-glanular ligament. Diagnosis is largely clinical, supported by adjunctive imaging when needed, while the glans hypermobility scale has emerged as an objective tool for intra-operative grading and decision-making. Conservative approaches such as observation, phosphodiesterase type-5 inhibitors, intraurethral vasoactive agents, and vacuum therapy may offer benefit in mild cases, but durable correction is most consistently achieved through glanulopexy techniques, which now demonstrate success rates exceeding 85%–95% with low morbidity. This review synthesizes historical perspectives, evolving diagnostic approaches, and contemporary surgical management strategies for SST deformity. Future research into minimally invasive fixation and injectable bulking agents may further expand the treatment armamentarium for this complex but correctable cause of dissatisfaction following IPP implantation.

KEYWORDS

floppy glans, glans hypermobility, penile implant, SST deformity

1 | INTRODUCTION

Inflatable penile prosthesis (IPP) implantation remains the most effective surgical treatment for men with refractory erectile dysfunction, with satisfaction rates exceeding 90% in most series[1]. The global use of penile prostheses has expanded significantly; between 2005 and 2012, a total of 63 013 penile prosthesis (PP) procedures were recorded worldwide[2], underscoring the importance of refining techniques and minimizing complications. Advances in prosthetic device technology and surgical techniques have dramatically reduced mechanical failures and infectious complications[3]. However, anatomic complications still occur and can compromise both function and satisfaction. One such complication is glans hypermobility, more commonly referred to as supersonic transporter (SST) deformity or floppy glans syndrome (FGS) (Figure 1). This condition is characterized by an abnormal droop of the glans penis despite adequate implant rigidity, resulting in cosmetic dissatisfaction, painful intercourse, and in some cases complete inability to engage in sexual intercourse[4,5]. The purpose of this review is to summarize the epidemiology, etiologies, and current

FIGURE 1 Supersonic transporter (SST) deformity, also known as "concord deformity" in which the glans droops ventrally.

management strategies for SST deformity, drawing from published literature and surgical experience.

2 | METHODS

We performed a comprehensive narrative literature review focusing on FGS/SST deformity. The review encompassed both early historical series and more contemporary high-volume surgical reports. Particular emphasis was placed on data regarding prevalence, etiological mechanisms, diagnostic tools, and therapeutic approaches ranging from conservative to surgical interventions.

Searches were conducted in PubMed and Scopus using combinations of the following keywords: "SST deformity," "supersonic transporter deformity," "floppy glans," and "glans hypermobility." The review period extended from 1980, corresponding to the first formal report of SST deformity and its surgical repair[6], through August 2025.

Articles were screened for relevance to SST deformity with respect to prevalence, etiology, diagnostic evaluation, and management. Eligible publications included original research, case series, and conference abstracts, the latter being incorporated due to their added value in a field where the complication is rare and peer-reviewed publications remain limited.

Studies not directly related to the condition or not available in English were excluded. The selected literature was then critically appraised, and findings were synthesized to provide a structured overview of the condition.

3 | PREVALENCE

The true incidence of SST deformity remains difficult to determine accurately due to a lack of a standardized definition and variable clinical significance. While the overall reported incidence is relatively low, a wide range of rates has been documented in the literature. For example, Vakalopoulos et al. reported an incidence of 3% (2 of 60 patients)[7], while Gupta and colleagues found a lower rate of 0.4% in their series of 240 patients[8]. Other studies have documented similarly low rates, with Kisa et al. observing just one case (0.8%) among 131 men who underwent either malleable or IPP[9].

The true prevalence may be underreported, as evidenced by studies that include delayed presentations or focus on revision cases. For instance, De Stefani et al. reported a total incidence of 10%, having included patients who required the corrective procedure postoperatively (4/86) in addition to those corrected intra-operatively (5/86)[10]. Furthermore, Henry et al., in a series of 200 revision procedures, found that 5% required reoperation specifically for SST deformity[11]. This suggests that while the issue may be less evident during the primary procedure, it is a significant factor requiring a revision surgery. On the other hand, Morey et al. reported that a minor degree of glans hypermobility, not severe enough to require intervention, may be observed in approximately one-quarter of patients at the time of primary penile implant insertion[12].

The surgical approach also appears to be a major determinant of prevalence. Jorissen et al. found that the incidence was notably higher with the infrapubic approach (9.6%), compared to a rate of only 1.35% in the penoscrotal group[13].

Recently, Köhler et al. (2025) reviewed 530 primary IPP cases from two high-volume prosthetic surgeons, reporting 139 cases of glans hypermobility (26.2%) of different grades of severity[14]. Notably, their reported incidence of 26.2% was far higher than in historical series, suggesting that earlier studies likely under-recognized the true prevalence of glans hypermobility.

The wide variability in reported prevalence reflects differences in study design, intra-operative recognition, and reporting practices. Earlier series likely underrecognized minor degrees of hypermobility, whereas prospective use of new diagnostic tools has revealed a higher true incidence.

Although the overall incidence remains relatively low across studies, the functional and psychological impact of SST deformity is disproportionately high. Even minor degrees of glans hypermobility may undermine patient satisfaction, compromise the ability to have sexual intercourse, and in some cases necessitate revision procedures. Consequently, careful intra-operative attention to cylinder sizing and positioning, as well as heightened awareness of patient-specific anatomical risk factors, is critical to minimizing this complication. Table 1 summarizes the published reports on the prevalence of SST deformity following penile prosthesis procedures.

4 | ETIOLOGY

The etiology of SST deformity is multifactorial. Traditionally, the condition is divided into two main categories: cases caused by distal corporal under dilatation or implant undersizing, and cases due to true glans hypermobility as a result of anatomical abnormalities[4]. In the classic form of SST deformity, also termed the "concorde deformity," the glans droops ventrally owing to short or proximally seated cylinders. Here, the corporal tips do not provide sufficient support to the glans and fail to compress the distal penile venous drainage, resulting in a visible ventral tilt. Conversely, true glans hypermobility may occur even in the presence of correctly sized and appropriately positioned cylinders. This is usually attributed to inherent weakness of the corporo-glans ligament or insufficient distal glandular structural support due to long standing ED or aggressive corporal dilatation, and may represent an anatomical predisposition[4]. Other presentations include dorsal droop, which is associated with oversized cylinders and sometimes referred to as a reverse SST deformity, and lateral droop, which typically results from corporal crossover during dilation[4]. In extreme cases of cylinder undersizing, the glans and distal shaft may lose structural support, creating a "flail penis" deformity[4]. Bickell et al. further emphasized that classification should separate mechanical issues such as undersizing or malposition from true hypermobility related to weakened corporo-glans attachments[4]. For surgeons, it is critical to distinguish between mechanical causes, such as undersizing, malposition, or crossover, and true glans hypermobility. This distinction is vital because each issue requires a different intervention: mechanical causes might necessitate revision or resizing, while glans hypermobility benefits from fixation procedures.

SST deformity presents either intra-operatively or in a delayed fashion post-operatively. It remains uncertain whether delayed cases are due to initial under-recognition or if they represent a genuinely acquired deformity. If true delayed-onset cases exist, they suggest a differing underlying mechanism from immediate cases, which could influence treatment protocols and the necessity for future research.

TABLE 1 Summary of published reports on the prevalence of SST deformity following penile prosthesis implantation.

Study	Population	Follow-up in months (mean ± SD)	Incidence of SST	Notes
Vakalopoulos et al.[7]	60 virgin IPP patients	41.3 ± 27.3	2 cases (3%)[a]	One case was managed conservatively and the other was repaired under local anesthesia
Gupta et al.[8]	240 IPP patients	> 30	1 case (0.4%)[a]	Single isolated case
Kisa et al.[9]	131 PP (malleable + inflatable)	—	1 case (0.8%)[a]	Following IPP revision case
De Stefani et al.[10]	86 PP patients	—	9 cases in total (10%)	5 required intra-operative repair[b], 4 delayed[a] (required glans fixation 4 weeks after the initial procedure)
Morey[12]	Primary implant patients	—	Around 25% (minor hypermobility)[b]	Often mild, not requiring intervention
Henry et al.[11]	200 revision IPP patients	55.7	10 cases (5%)[a]	5% of revision cases were done for SST deformity
Jorissen et al.[13]	126 IPP patients	39.4 ± 2.3	6 cases (4.8%)[a]	Higher rate in infrapubic (9.6%) vs. penoscrotal (1.35%) approach
Köhler et al.[14]	530 primary IPP patients	—	139 cases (26.2%)[b]	Largest series; graded with GHS: 86 grade 1, 29 grade 2, 24 grade 3. 11 patients underwent immediate repair.

Abbreviations: GHS, glans hypermobility scale; IPP, inflatable penile prosthesis; PP, penile prosthesis; SST, supersonic transporter.

[a]Post-operative complication.

[b]Intra-operative findings.

5 | DIAGNOSIS

The diagnosis of glans hypermobility is primarily clinical, established during physical examination or intra-operative inspection after IPP placement. Patients typically present with glans droop or malalignment relative to the corporal shaft despite full inflation of the cylinders. This may be reported subjectively as painful intercourse, cosmetic dissatisfaction, or difficulty with penetration.

Imaging can aid in distinguishing glans hypermobility from mechanical complications such as undersized or malpositioned cylinders. Ultrasound or magnetic resonance imaging (MRI) may help confirm corporal seating and exclude crossover or malposition in ambiguous cases[4,15]. Skrodzka et al. highlighted that adjunctive imaging, particularly penile ultrasound and MRI, can be invaluable in ambiguous cases, allowing confirmation of correct implant seating and identification of distal fibrosis or ligament laxity[15].

First objective, reproducible grading tool for this condition has recently been introduced. Köhler et al. developed the glans hypermobility scale (GHS), which provides an intra-operative measure of severity[14]. This system categorizes hypermobility from grade 0 (no hypermobility, excellent glans seating) to grade 3 (instability with palpation of both cylinder tips outside the glans). In addition to severity, the GHS records the directionality of deformity (ventral, dorsal, lateral, or combinations). In their cohort of 530 primary IPP patients, 26.2% demonstrated glans hypermobility, with 16.2% grade 1, 5.5% grade 2, and 4.5% grade 3. Notably, each 1 cm increase in implant size reduced the risk of hypermobility by 11%, underscoring the role of appropriate device sizing in prevention.

While diagnosis is primarily clinical, imaging is valuable when cylinder malposition is suspected. The GHS represents a step toward objectivity, but its adoption requires validation across institutions and correlation with patient-reported outcomes.

6 | MANAGEMENT

A structured diagnostic and therapeutic approach is summarized in Figure 2, outlining intra-operative and post-operative decision-making steps based on glans hypermobility grade and clinical presentation.

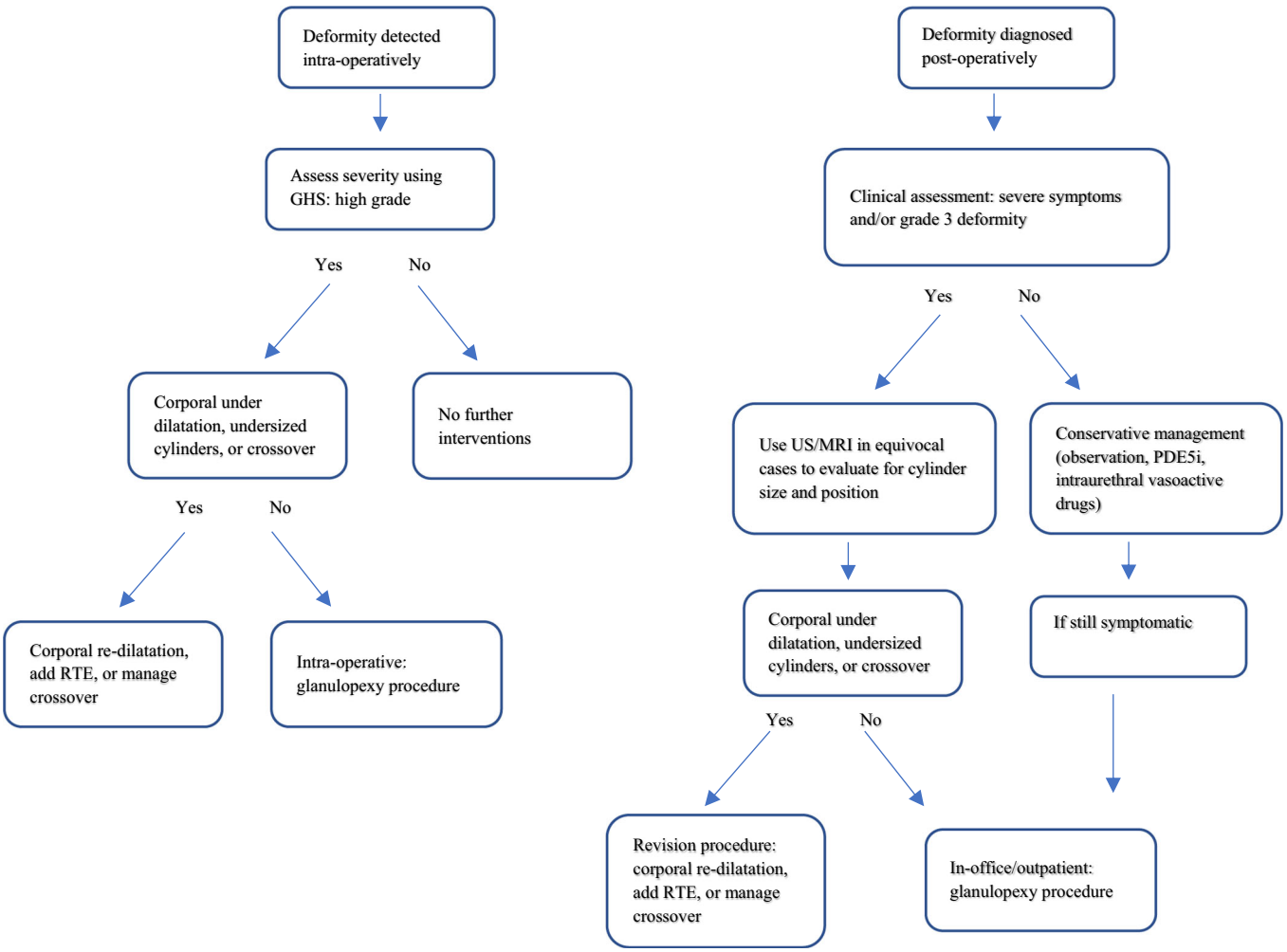

FIGURE 2 Diagnostic and management algorithm for floppy glans syndrome (FGS)/supersonic transporter (SST) deformity. GHS, glans hypermobility scale; MRI, magnetic resonance imaging; PDE5i, phosphodiesterase type 5 inhibitors; RTE, reat tip extender.

6.1 | Conservative and medical treatment

Some surgeons advocate for delaying glanulopexy, opting for observation over several months. This approach is supported by reports suggesting that post-operative healing and the formation of a fibrous capsule around the distal cylinder tips can naturally stabilize the glans, potentially resolving the hypermobility without further intervention[12,16].

Morey noted in an editorial comment that although glans hypermobility may be seen in around 25% of men at the time of prosthesis placement, formal glanulopexy is required in < 5% of cases; however, this reflects expert opinion from his own experience, with the number of cases not specified and no study-level outcomes provided (low level of evidence)[12].

6.1.1 | Phosphodiesterase type 5 inhibitors (PDE5i)

Oral agents such as sildenafil may improve glans engorgement and patient-reported satisfaction in men with an IPP who complain of a soft glans; however, the evidence is limited to small, uncontrolled cohorts. In a 32-patient series, Mulhall et al. observed subjectively increased glans engorgement in all participants and significant improvements in IIEF satisfaction items after adding sildenafil to the post-IPP period; there was no randomization or objective glans measure[17]. Likewise, Mireku-Boateng et al. reported significant gains on IIEF satisfaction items in 12 IPP patients after ≥ 5 sildenafil doses[18]. Notably, these cohorts evaluated IPP patients with reduced glans tumescence rather than a formally defined SST/floppy glans deformity; nonetheless, the clinical scenario is analogous. Taken together, PDE5i should be framed as an adjunct for mild cases or a temporizing strategy, not a proven disease-modifying treatment.

6.1.2 | Intraurethral vasoactive therapy

Intraurethral alprostadil (MUSE) has been evaluated in a small, uncontrolled cohort of men with an IPP who complain of a soft/"cold" glans. In a series by Benevides & Carson ($n = 28$ total), the soft-glans subgroup ($n = 17$) reported 59% satisfaction with improved glans engorgement after MUSE use; 10/17 continued therapy for a mean of 6.3 months, but pain was common: all 7 who were unsatisfied or stopped cited disabling penile pain. Given the old device design, heterogeneous population, short follow-up, and absence of a control arm, the quality of evidence is low/very low. Accordingly, MUSE should be framed as an adjunct for mild cases or a temporizing strategy, not a condition-modifying treatment[19].

6.1.3 | Vacuum erection devices (VED)

VEDs have also been explored as an adjunct in patients with prostheses. Söderdahl et al. reported that > 90% of men using VEDs in conjunction with IPP or malleable implants noted improved penile length, girth, and rigidity[20]. While theoretical concerns exist regarding mechanical stress on the cylinders, available data suggest that careful use is safe and can improve functional outcomes in selected patients.

6.1.4 | Injectable bulking agents (Durasphere®)

A novel approach involves injection of Durasphere®, a pyrolytic carbon-coated bead suspension, into the glans to provide mechanical support. Perito group presented early data at the AUA, reporting favorable outcomes for hypermobile glans in men with penile prostheses[21]. While still investigational, injectable bulking offers a minimally invasive alternative in selected cases and may be particularly useful when patients decline surgical fixation.

6.2 | Surgical correction

Surgical correction remains the most effective management strategy for moderate to severe SST deformity, particularly when conservative measures have failed or when cylinder undersizing/malposition has been excluded. Over the past four decades, numerous techniques have been described, all operating on the same fundamental principle of providing sufficient distal support to the glans.

6.2.1 | Ball's procedure (1980)

Ball first described surgical repair of SST deformity in 1980[6]. His technique involved a transverse incision on the distal penile shaft approximately 2 cm proximal to the corona, followed by dissection to expose Buck fascia. Fixation sutures were then placed between the glans corona beneath the elevated distal skin flap and anchored into Buck fascia using 2-0 silk sutures. Knots were deliberately tied away from the dorsal midline to minimize risk to the neurovascular bundle, and care was taken not to pass the sutures deep enough to puncture the prosthesis cylinders. Anesthesia details were not specified in Ball's report.

This technique effectively corrected cases where the glans was excessively mobile despite appropriate prosthetic sizing. Ball's contribution was the recognition that SST deformity was not always due to improper cylinder sizing, but could result from inadequate glans support.

His method demonstrated that direct fixation of the glans could restore anatomical alignment.

6.2.2 | The glandular hitch by De Stefani et al. (1994)

In 1994, De Stefani and colleagues refined glans fixation by describing the anterolateral "glandular hitch"[10]. Following full inflation of the cylinders, a small transverse subcoronal incision was made, and dissection was carried laterally under the glanular wings to minimize the risk of injury to the dorsal neurovascular bundle while maintaining close contact with the tunica albuginea. Non-absorbable 3-0 monofilament polypropylene horizontal mattress sutures were placed anterolaterally between the tunica and the glans spongy tissue, drawing the glans down securely over the cylinder tips. During suture passage, gentle downward pressure was applied on the cylinder tips to prevent inadvertent prosthesis puncture. When performed as a delayed procedure, the described technique was successfully carried out under local anesthesia, with patients discharged within an hour.

6.2.3 | Glanulopexy by Mulhall and Kim (2001)

In 2001, Mulhall and Kim published a series of 10 patients who underwent glanulopexy for disabling SST deformity[22]. Their approach used a dorsal subcoronal incision across approximately one-third of the penile circumference, made about 0.5 cm proximal to the coronal sulcus. Careful dissection was carried out to separate the glans from the distal corporal tips, with elevation of Buck's fascia while avoiding the dorsal neurovascular bundle. Loupe magnification was used throughout to enhance visualization of fine dorsal neural branches. Two horizontal mattress sutures of 2-0 non-absorbable monofilament nylon on a tapered needle were placed bilaterally, passing through the tunica albuginea of the corpora cavernosa and the fascial undersurface of the glans. Buck's fascia and available subcutaneous tissue were closed over the suture line, and the skin was re-approximated with 3-0 absorbable Monocryl in a subcuticular fashion. Downward pressure was applied on the prosthesis cylinders during suture passage to prevent inadvertent puncture. All procedures were performed in an ambulatory setting under local penile block anesthesia (1% lidocaine + 0.25% bupivacaine) with IV sedation. Patients were discharged home within hours of the procedure. They were instructed to abstain from intercourse for four weeks, after which prosthesis activation and sexual activity were permitted. Follow-up at 1 month, 6 months, and 12 months demonstrated stable anatomical correction. All patients achieved glans stability and penetrative function, and 90% reported full satisfaction, and importantly, no sensory alterations of the glans or prosthesis injuries occurred. This study confirmed that glanulopexy could be safely performed with durable functional outcomes in a minimally invasive outpatient setting.

6.2.4 | Glandular–tunical stabilization by Hirsch and Moy (2000)

Around the same time, Hirsch and Moy described glandular-tunical stabilization in a case report[23]. Their technique involved anchoring the glans more directly to the tunica albuginea, aiming to minimize the degree of dissection and thereby reduce the risk of altered sensation.

6.2.5 | Ventral or dorsal penoplasty by Yang et al. (2015)

In addition to fixation-based methods, penoplasty has been introduced as a reconstructive approach for hypermobile glans. Yang and colleagues presented their experience as a conference poster abstract in 2015, describing both ventral and dorsal penoplasty techniques for floppy glans after penile prosthesis in a series of 10 patients[24]. The technique involves placement of clamps on the penile aspect opposite the direction of droop. Once the glans is aligned with the distal shaft, the clamps are adjusted to optimize correction. Excess skin and dartos fascia are excised elliptically, creating a relatively large defect. Closure is then performed in a transverse fashion with simple interrupted absorbable sutures. The dartos layer is closed first, as this layer provides the primary tensile strength, followed by closure of the skin. Because fixation is superficial to Buck's fascia and tunica, the method avoids deep dissection to the corporal tips, minimizing risk of prosthesis and neurovascular bundle injury. The procedure can be performed under local, regional, or general anesthesia, depending on whether it is combined with primary implant placement or performed as a delayed revision. Operative time is brief, usually less than 20 minutes. Post-operative recommendations included delayed prosthesis activation at 4–6 weeks, and sexual abstinence for 6 weeks to allow adequate healing. All patients were satisfied with cosmetic and functional results, and no re-intervention was required. This technique provides enhanced stability in cases of severe hypermobility or recurrent deformity after prior glanulopexy.

6.2.6 | Modified minimally invasive glanulopexy by Ziegelmann et al. (2018)

Ziegelmann and colleagues introduced a modified minimally invasive glanulopexy that represented the

most refined iteration to date[25]. Their technique involved making two small 1-cm longitudinal incisions on the lateral aspects of the distal penile shaft, dissecting only to Buck fascia without circumferential mobilization. Permanent two braided sutures (2-0 Ethibond) were sutured into the distal tunica albuginea followed by passing another third 2-0 Ethibond suture on CT-2 needle through the glans (halfway between the corona and the tip, as laterally as possible to distribute force) and tying it to the previously placed two sutures. This modification reduced dissection significantly, minimized the risk of neurovascular bundle injury, and allowed for better cosmetic outcomes. During suture placement, prosthesis cylinders are deflated and milked proximally to avoid inadvertent puncture. Importantly, the procedure could be performed under local anesthesia, making it feasible even in delayed or office-based settings. The patients were instructed on sexual abstinence for at least 6 weeks. In this series of 12 men (9 primary or revision implants, 3 delayed repairs), all achieved anatomic correction with no sensory alterations at a median follow-up of 12 months. Complications included one infection related to pump in an immunosuppressed patient and one patient-requested device removal for dissatisfaction.

6.2.7 | Outcomes of surgical management

Across published series, surgical correction of SST deformity has consistently yielded high success rates, with more than 85%–95% of patients reporting anatomical correction and improved sexual satisfaction[6,10,22–25]. Importantly, most series have not demonstrated significant changes in penile sensitivity, alleviating concerns about sensory loss from glans fixation (Table 2). Durability of correction appears robust at 1–2 years, although long-term multicenter data remain limited. Complications are uncommon, with infection being the most significant, though rare, adverse event.

7 | PREVENTION

Prevention of FGS begins with meticulous distal corporal dilation to avoid undersizing and ensure optimal cylinder support. Surgeons should employ appropriate instruments, such as the cavernotome or Uramix dilator, particularly in cases of distal corporal fibrosis and scarring, to achieve complete distal dilatation. Adequacy of dilation can be verified with the distal “goalpost” maneuver, in which simultaneous passage of two dilators into both corpora allows the surgeon to confirm that dilation tracks are parallel, both distal tips reach the glans, and no crossover has occurred. If crossover is identified at this stage, immediate correction prevents cylinder malposition and the downstream risk of floppy glans. After cylinder placement, intra-operative inflation of the prosthesis is critical to verify proper distal seating of the cylinders. At this point, checking for SST/FGS deformity, either clinically or, for example, using the GHS, should be performed; if high-grade deformity is identified, immediate glanulopexy should be considered rather than delayed intervention. This structured approach, combining robust distal dilation, systematic crossover/cylinder seating assessment, and intra-operative GHS scoring, represents the cornerstone of prevention.

8 | LIMITATIONS

This review has several important limitations. First, FGS/SST deformity remains a rare and likely underreported complication of penile prosthesis surgery, which restricts the available evidence base. The majority of management reports consist of small case series, case reports, or conference abstracts, and there are no randomized or head-to-head comparative studies evaluating the outcomes of different surgical or conservative strategies. Follow-up in most available series is short-term, limiting conclusions about the durability of interventions. In addition, while multiple conservative options such as PDE5 inhibitors, intraurethral alprostadil, and VEDs have been described, these were often studied in prosthesis patients with a “soft glans” or reduced tumescence rather than in cohorts specifically defined as having FGS/SST deformity. As a result, there is a paucity of robust data specifically assessing nonsurgical management of FGS. These limitations underscore the need for larger, prospective, and comparative studies to define optimal prevention and management strategies.

9 | CONCLUSION

SST deformity and FGS represent rare but significant complications of penile prosthesis implantation. The condition can result from short or malpositioned cylinders, corporal crossover, or true glans hypermobility caused by weak glans support structures. While conservative measures such as PDE5 inhibitors, intraurethral therapy, vacuum devices, and injectable bulking agents may provide symptomatic improvement, surgical correction remains the definitive treatment. Over the past four decades, surgical techniques have evolved from Ball's early fixation method to contemporary minimally invasive glanulopexy, with consistently high success and patient satisfaction. Future directions include the wider adoption of GHS to standardize intra-operative assessment, incorporation of imaging modalities such as penile ultrasound and MRI for difficult cases, and refinement of preventive strategies such

TABLE 2 Key studies on SST deformity/floppy glans.

Author (year)	Study design	Number of patients	Technique	Follow-up in months (mean ± SD)	Key outcomes	Complications (type/rate)
Ball (1980)[6]	Case report	1[a]	Transverse sub coronal incision, fixation of glans to Buck's fascia bilaterally	—	First description; corrected droop in patient with proper sizing	—
De Stefani et al. (1994)[10]	Retrospective	9 (5[b] + 4[a])	Anterolateral "glans hitch" fixation between tunica albuginea and glans spongy tissue	—	Restored alignment; effective even when malposition not evident intra-op	None
Mulhall & Kim (2001)[22]	Retrospective	10[*]	Dorsal subcoronal incision, glanulopexy to the tunica albuginea	9 ± 4	90% satisfaction; restored penetrative intercourse	None
Yang et al. (2015)[24]	Retrospective (conference abstract)	10	Excision of skin & dartos elliptical segment dorsally or ventrally	—	All patients were satisfied, none required additional procedures	—
Bickell et al. (2016)[4]	Review	N/A	Defined true hypermobile glans vs. SST deformity vs. other deformities	N/A	Clarified nomenclature, outlined treatment pathways	N/A
Skrodzka et al. (2020)[15]	Review	N/A	Classification + imaging	N/A	US/MRT recommended in ambiguous cases; stressed corporo-glans ligament role	N/A
Ziegelmann et al. (2018)[25]	Retrospective	12 (9[b] + 3[a])	Modified lateral-incision glanulopexy	12 (median)	100% correction; office/local feasible	Infection/1 patient
Köhler et al. (2025)[14]	Retrospective	139[b]	Evaluating glans hypermobility scale (GHS) + repair of high-grade deformity	< 12	Incidence 26.2%(139/530); grading system standardized; 11 patients required repair	Recurrence/1, suture granuloma/1

Note: Evidence level: All studies are low-level evidence (level IV–V: case series or case reports).

[a]Post-operative complication.

[b]Intra-operative findings.

as meticulous sizing and identification of patients with weakened corporo-glans ligament support. Novel adjunctive approaches, including injectable bulking agents may also expand the treatment armamentarium.

AUTHOR CONTRIBUTIONS

Mohammed Mahdi participated in study concept and design. Mohammed Mahdi, Thairo A. Pereira, and Muhammed A. M. Hammad all contributed to literature review, data acquisition, drafting, and editing of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The authors have nothing to report.

ETHICS STATEMENT

This article is a narrative review based on previously published studies. No new studies involving human participants or animals were conducted by the authors, and therefore no institutional review board (IRB) approval or informed consent was required. All data discussed have been previously published and are cited accordingly.

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