

Pediatric supernumerary testis: preservation, orchiopexy, or orchiectomy? A contemporary review of diagnosis and surgical decision-making

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ABSTRACT

Polyorchidism is a rare congenital anomaly in which more than two testes are present. In children, its importance lies less in its rarity than in the surgical dilemma created when an additional gonad is identified during examination, imaging, or surgery for cryptorchidism, hernia, torsion, or an inguinoscrotal mass. This review examines the contemporary evidence on pediatric supernumerary testes and proposes a practical framework for deciding when a viable gonad should be preserved, fixed, or removed. A focused narrative review was undertaken using key historical publications, systematic reviews, contemporary pediatric pooled analyses, and selected case reports relevant to embryology, classification, imaging, diagnostic pitfalls, torsion, malignancy, reproductive potential, and surgical management. The available evidence supports a preservation-oriented approach for a viable, morphologically reassuring supernumerary testis when surveillance is feasible. Orchiopexy is appropriate when a viable gonad is malpositioned or has a demonstrable fixation abnormality, whereas orchiectomy remains appropriate for irreversible ischemia, severe atrophy or involution, grossly abnormal tissue, or genuine oncological suspicion. The absolute malignant risk of a normal pediatric supernumerary testis remains uncertain and should not be inferred directly from historical case-report series. Management should therefore be individualized according to viability, morphology, position, vascular and ductal anatomy, associated cryptorchidism, torsion risk, oncological concern, and feasibility of follow-up. The presence of a supernumerary testis alone is not an indication for orchiectomy.

Keywords: Polyorchidism, supernumerary testis, cryptorchidism, orchiopexy, orchiectomy, testicular torsion, ultrasonography

INTRODUCTION

Polyorchidism is among the rarest congenital anomalies of the male gonad. It is defined by the presence of more than two testes, most commonly three, although more complex forms have occasionally been described. Despite its rarity, the anomaly presents a familiar surgical problem: whether tissue that appears testicular but is anatomically unusual should be preserved, repositioned, or removed.

The evidence available to answer this question is inherently imperfect. Most of the historical literature consists of individual case reports and small case series. Bergholz and Wenke¹ synthesized 140 histologically confirmed cases in their meta-analysis, while Balawender et al.² later incorporated contemporary imaging-based diagnoses and demonstrated the increasing role of conservative management. More recently, Fang et al.³ analyzed a two-center pediatric cohort and pooled 113 children with 127 supernumerary testes.

These studies improve our understanding of presentation and management, but they do not eliminate the limitations created by rarity, publication bias, incomplete follow-up, and changing diagnostic practice.

This limitation should shape the way the literature is interpreted. Percentages derived from published cases should not automatically be treated as population risks, and management preferences should not be mistaken for evidence-based mandates.

The additional testis may be identified as an asymptomatic scrotal structure, during evaluation of an inguinal mass, or unexpectedly during surgery for cryptorchidism, inguinal hernia, or testicular torsion. Published pediatric experience illustrates this spectrum. Baltogiannis et al.⁴ described triorchidism associated with cryptorchidism encountered



during orchiopexy. A later report by Baltogiannis et al.⁵ directly discussed conservative versus surgical management. In 2017, the same group reported an atypically positioned supernumerary testis presenting as an inguinal mass after previous surgery for cryptorchidism.⁶ These observations were separated by more than a decade, but all raised the same operative question: what is the value of the additional gonad, and what is gained—or lost—by removing it?

Contemporary management has moved away from routine orchiectomy. This shift is reasonable, but it should not be converted into a new dogma. A healthy, vascularized, morphologically normal testis is not equivalent to a severely atrophic intra-abdominal gonad, and neither is equivalent to a nonviable torsed testis or a lesion suspicious for neoplasia. For this reason, the management question is better framed as preserve, fix, or remove rather than simply conservative versus surgical treatment.

LITERATURE SEARCH AND SELECTION

For this focused narrative review, PubMed-indexed publications were searched through September 2025 using the terms “polyorchidism,” “supernumerary testis,” and “triorchidism,” combined with terms related to children, imaging, torsion, malignancy, orchiopexy, and orchiectomy. Reference lists of relevant reviews were also examined for pertinent older reports. Publications were selected for their relevance to pediatric presentation, anatomical classification, diagnostic imaging, complications, and surgical decision-making. Historical reports, major pooled reviews, the recent pediatric analysis, and illustrative case reports were included. No formal systematic screening, risk-of-bias assessment, or meta-analysis was performed for this narrative review.

EMBRYOLOGY AND ANATOMICAL DEVELOPMENT

The precise embryologic mechanism of polyorchidism remains uncertain. The most widely accepted explanation involves abnormal division of the genital ridge before completion of gonadal differentiation, although the timing and plane of division may vary. This can result in different relationships between the supernumerary testis, epididymis, and vas deferens.

The anatomical variation is clinically more important than the embryological theory itself. A supernumerary testis may have its own epididymis and vas deferens, may share one or both structures with the adjacent testis, or may lack a draining vas. Nocks⁷ described polyorchidism with equal-

sized testes and normal spermatogenesis and proposed an embryologic mechanism based on division of the genital ridge. That report remains relevant because it demonstrates that an additional testis cannot automatically be considered functionless.

Nevertheless, the presence of apparently normal testicular tissue does not establish an independent fertility contribution. The true reproductive value of most supernumerary testes remains uncertain, particularly in children, where long-term functional data are sparse. Anatomy can suggest potential function, but it should not be made to prove more than it actually does.

CLASSIFICATION: WHAT IS USEFUL AT THE OPERATING TABLE?

Singer, Donaldson, and Jackson⁸ developed a functional classification based on anatomical organization and the relationship of the testes to their drainage pathways. Bergholz et al.⁹ later emphasized whether the additional gonad was drained by a vas deferens and proposed an anatomical classification that remains clinically useful.

A viable gonad connected to an epididymis and vas deferens has a plausible reproductive role. An undrained gonad is less likely to contribute to fertility. However, classification should not dictate treatment mechanically. A gonad with apparently favorable ductal anatomy may still be severely atrophic or ischemic, while an undrained gonad may still contain viable endocrine tissue. Shared vascular or ductal anatomy may also make attempts at separation more dangerous than leaving both testes intact.

For the pediatric surgeon, three anatomical questions may therefore be more useful than the label itself: Is the supernumerary testis viable and well vascularized? Does it have an epididymal or vasal connection suggesting functional anatomy? Can it be left or placed in a position in which it can be safely examined and followed? The principal classification systems and their practical surgical relevance are summarized in Table.

CLINICAL PRESENTATION AND ASSOCIATED ANOMALIES

Most children do not present because polyorchidism is already known. A painless scrotal structure is common, but contemporary pediatric data show substantial variation. Fang et al.³ documented asymptomatic presentations as well as cryptorchidism, inguinal hernia, and torsion. Balawender et

Table. Anatomical classifications of polyorchidism and practical surgical relevance			
System	Basis	Key categories	Practical surgical relevance
Singer et al.	Functional/anatomical relationship	Anatomical configuration and drainage pattern linked to potential reproductive function.	Introduced the principle that management should reflect anatomy and potential function rather than numerical redundancy.
Bergholz et al.	Drainage by vas deferens and relation of epididymal/vasal structures	Type A: draining vas deferens; type B: no draining vas deferens; type A subgroups describe shared or separate epididymal/vasal anatomy.	Useful for describing ductal anatomy and potential reproductive relevance; should not be used as an automatic treatment rule.
Operative assessment	Direct anatomy and tissue quality	Viability, morphology, vascular pedicle, epididymis, vas deferens, position, and mobility.	Determines whether preservation, orchidopexy, or excision is technically safe in the individual child.



al.² found 76% of supernumerary testes to be scrotal and 24% extrascrotal; among extrascrotal testes, most were inguinal.

The left side predominates in the major pooled series.^{1,3} The reason for this distribution remains uncertain and should not be overinterpreted. Associated abnormalities matter mainly because they often determine how and when the diagnosis is made.

The 2005 report by Baltogiannis et al.⁴ illustrates intraoperative discovery during orchiopexy for cryptorchidism. Their 2017 report illustrates a different problem: after previous orchiopexy, an inguinal mass was ultimately found to represent additional testicular tissue.⁶ The lesson is not that every inguinal mass in a child with cryptorchidism represents polyorchidism, but that abnormal gonadal descent should lower the threshold for considering atypical testicular anatomy.

DIAGNOSTIC PITFALLS AND IMAGING

Ultrasonography with color Doppler is the first-line imaging modality. In an uncomplicated intrascrotal case, a homogeneous oval structure with echogenicity and vascularity similar to the normal testis may be sufficiently characteristic to avoid exploratory surgery. Chung and Yao¹⁰ demonstrated this classic pattern and the value of high-resolution sonography.

Diagnostic confidence falls when the supernumerary testis is small, extrascrotal, distant from the orthotopic testis, or associated with other urogenital abnormalities. Fang et al.³ reported an ultrasonographic misdiagnosis rate of 22.22% in their pooled pediatric analysis, with misdiagnosis associated with younger age, extrascrotal location, greater distance from the orthotopic testis, and concomitant anomalies. The atypical inguinal presentation described by Baltogiannis et al.⁶ reflects the same practical difficulty.

Magnetic resonance imaging may add value when ultrasonography is equivocal, when the gonad is extrascrotal, or when anatomical relationships or a focal lesion are not adequately characterized. Yalçinkaya et al.¹¹ showed the complementary role of sonography and MRI, while Danrad et al.¹² suggested that imaging can help define epididymal and ductal anatomy relevant to potential reproductive function. MRI should not, however, be performed simply because polyorchidism is rare. In a child with an unequivocally normal intrascrotal supernumerary testis, additional imaging is difficult to justify if it will not change management.

TORSION: A REAL RISK, BUT NOT A UNIVERSAL INDICATION FOR FIXATION

Torsion is an important acute complication reported in association with polyorchidism. Ferro and Iacobelli¹³ described two children with duplicated scrotal testes and bell-clapper deformity and performed orchidopexy of testes judged to be at risk. Their report provides direct operative evidence that abnormal fixation may coexist with gonadal duplication.

That observation should not be extended beyond what it proves. Published torsion cases are subject to reporting bias, and no study has established the absolute incidence of torsion in an unselected pediatric population with supernumerary testes. Prophylactic exploration and fixation of every incidentally diagnosed intrascrotal supernumerary testis therefore cannot be supported.

Fixation is more defensible when there is a specific anatomical problem: a viable cryptorchid testis requiring orchidopexy, a gonad that has detorsed and recovered perfusion, a bell-clapper deformity, or marked abnormal mobility encountered at surgery.

MALIGNANCY: WHAT DO WE REALLY KNOW?

Concern regarding malignancy has historically been a major argument for orchiectomy. Bergholz and Wenke¹ identified neoplasms among published histologically confirmed cases and noted that malignant tumors with known location occurred predominantly in cryptorchid supernumerary testes. This association deserves attention, but the denominator deserves equal attention.

Historical percentages derived from collections of published cases are not prospective lifetime risks. Rare tumors and unusual complications are more likely to be reported than uncomplicated children who remain well. The resulting publication bias makes it unsafe to present a single historical percentage to families as the expected cancer risk of a normal intrascrotal supernumerary testis.

Contemporary pediatric evidence supports caution against routine prophylactic removal. In the pooled analysis by Fang et al.,³ none of 53 postoperative pathology specimens was malignant. This does not prove lifelong oncological safety; the patients were children, follow-up was limited, and specimens came from a selected surgical population. The more defensible conclusion is that malignancy is possible, cryptorchid or abnormal location increases concern, but the absolute risk in an otherwise normal pediatric supernumerary testis remains uncertain.

REPRODUCTIVE AND ENDOCRINE POTENTIAL

Some supernumerary testes have normal size, echotexture, vascularity, epididymal anatomy, and vasal drainage. Normal spermatogenesis has been documented in selected cases.⁷ Danrad et al.¹² further suggested that imaging-defined epididymal and vasal anatomy may help infer potential reproductive relevance.

These observations make routine removal of normal tissue difficult to justify. They do not establish that retaining an additional testis improves future fertility, and there are no meaningful comparative pediatric studies demonstrating such an outcome. The same limitation applies to endocrine function. The argument for preservation should therefore remain modest and defensible: viable normal gonadal tissue should not be sacrificed without a valid clinical reason.



SURGICAL DECISION-MAKING: PRESERVE, FIX, OR REMOVE?

Earlier reports by Baltogiannis and colleagues⁴⁻⁶ span the evolution of this debate: triorchidism associated with cryptorchidism in 2005, direct discussion of conservative versus surgical management in 2007, and an atypical extrascrotal presentation illustrating diagnostic uncertainty in 2017. Viewed together, these reports reinforce a point that remains relevant: the decision should be made for the individual gonad, not for the diagnosis of polyorchidism.

Preservation

Preservation is favored when the supernumerary testis is viable, well perfused, morphologically reassuring, free of a suspicious focal lesion, scrotal or capable of safe scrotal placement, and suitable for reliable surveillance. A recognizable epididymal or vasal connection further supports preservation because it suggests potential reproductive anatomy.^{8,9,12}

Observation is particularly reasonable for an uncomplicated intrascrotal testis diagnosed confidently on imaging. Khedis et al.¹⁴ advocated a selective management strategy rather than routine excision. The systematic review by Balawender et al.² similarly documented observation in 46% of patients.

Orchiopexy

A viable testis should be fixed when there is a specific correctable anatomical problem. Examples include cryptorchid or ectopic position when tension-free orchidopexy is feasible, torsion in which perfusion is restored, bell-clapper deformity, or clearly abnormal mobility. Fixation should preserve rather than compromise vascular supply.

Orchiectomy

Orchiectomy remains appropriate for irreversible ischemia or necrosis, severe atrophy or involution, grossly dysplastic testicular tissue, a suspicious intratesticular lesion, or an abnormal extrascrotal gonad that cannot be safely positioned or meaningfully followed. Extrascrotal location alone should not automatically mean removal. A viable inguinal testis that can be safely brought into the scrotum is different from a severely atrophic intra-abdominal gonad.

SHARED VASCULAR AND DUCTAL ANATOMY: PROTECT THE BETTER TESTIS

Supernumerary and orthotopic testes may share an epididymis, vas deferens, vascular pedicle, or combinations of these structures. Bergholz et al.⁹ reported a child in whom a supernumerary testis had its own epididymis and deferent duct but shared the blood supply with the ipsilateral distal testis. Such anatomy makes the risk of injuring the better-developed gonad a central operative consideration.

From a surgical standpoint, removal of an additional testis is not justified if the dissection required to remove it creates avoidable vascular or ductal risk to a normal dominant testis. This is not a formal guideline derived from comparative trials; it is a surgical principle. When separation appears

hazardous and neither gonad is suspicious, preservation may be safer than anatomical perfection.

POLYORCHIDISM ASSOCIATED WITH CRYPTORCHIDISM

Cryptorchidism changes the risk-benefit calculation because it complicates surveillance and is independently associated with impaired germ-cell development and testicular malignancy. Mathur et al.¹⁵ and other pediatric reports have documented the association between polyorchidism and cryptorchidism. The report by Baltogiannis et al.⁴ illustrates the classic situation in which triorchidism is discovered during orchiopexy.

At exploration, each gonad should be assessed independently for size, consistency, perfusion, epididymal anatomy, vas deferens, vascular pedicle, mobility, and the feasibility of tension-free scrotal placement. The presence of two ipsilateral gonads does not mean that one must be removed.

A viable testis that can be safely positioned in the scrotum may reasonably be preserved and fixed. A severely atrophic or nonviable gonad may reasonably be excised. If either preservation or removal threatens the vascular or ductal anatomy of the better-developed gonad, protection of the dominant testis takes priority.

FOLLOW-UP AFTER CONSERVATIVE MANAGEMENT

The literature frequently recommends clinical and ultrasonographic follow-up, but no validated surveillance schedule exists for children with polyorchidism. Published intervals reflect local practice rather than evidence that one schedule improves outcomes.

For a normal intrascrotal supernumerary testis, follow-up can reasonably include periodic clinical examination and ultrasound to document growth, morphology, vascularity, and absence of a new focal lesion. Long-term conservative follow-up has been described in selected patients with reassuring imaging.^{16,17} As the child matures, education regarding a new mass, persistent pain, or change in testicular consistency is reasonable. Routine serial tumor markers in an asymptomatic child with normal imaging are not supported by evidence, and repeated MRI in an uncomplicated scrotal case is difficult to justify.

PROPOSED PRESERVE-FIX-REMOVE FRAMEWORK

The proposed algorithm begins with confirmation that the structure represents testicular tissue and assessment of viability. A viable, reassuring, scrotal supernumerary testis is preserved and observed. A viable testis that is cryptorchid, ectopic, or demonstrably at risk because of abnormal fixation is preserved and fixed when this can be achieved safely. Irreversibly ischemic, severely atrophic, involuted, or genuinely suspicious tissue may be removed.

Shared vascular or ductal anatomy is a separate decision point. If removal of the supernumerary gonad risks the dominant ipsilateral testis, protection of the better testis takes priority. **Figure** presents this sequence as the proposed Preserve-Fix-Remove framework.

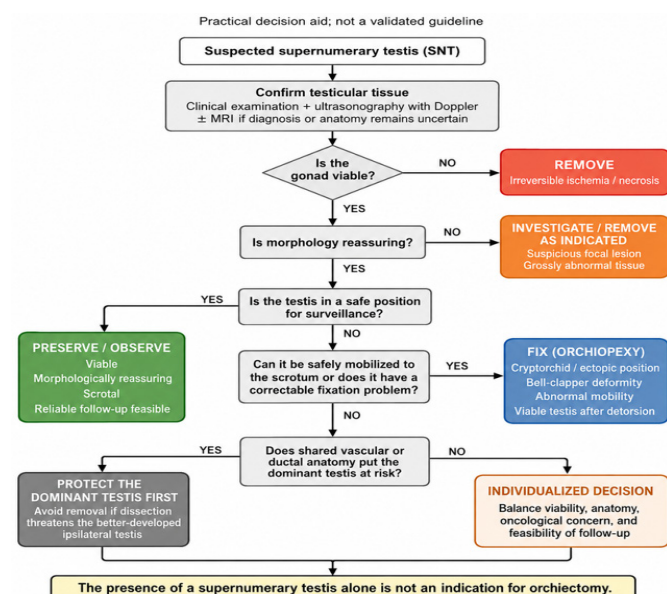


Figure. Proposed Preserve-Fix-Remove framework for pediatric supernumerary testes. The algorithm is intended as a practical synthesis of the available evidence and surgical principles rather than a validated clinical guideline

MRI: Magnetic resonance imaging

LIMITATIONS OF THE AVAILABLE EVIDENCE

There are no randomized studies, prospective comparative management trials, or large population-based cohorts of children with polyorchidism. Most evidence arises from case reports and retrospective pooled analyses collected over decades during which imaging, pathology, orchidopexy techniques, and attitudes toward gonadal preservation have changed. Exceptionally unusual anatomical variants, including reports of more than three testes, further illustrate the heterogeneity of the literature.¹⁸

Publication bias is unavoidable: malignancy, torsion, unusual anatomy, and operative surprises are more likely to be reported than uncomplicated long-term observation. Long-term fertility and endocrine outcomes are poorly documented. The proposed Preserve-Fix-Remove framework should therefore be interpreted as a practical decision aid, not as a validated guideline.

CONCLUSION

Polyorchidism in childhood is rare, but the management problem it creates is familiar to the pediatric surgeon: whether anatomical abnormality justifies removal of potentially useful tissue. The available evidence does not support orchiectomy merely because a supernumerary testis is present. Management should be individualized according to viability, morphology, position, vascular and ductal anatomy, associated cryptorchidism, torsion risk, oncological suspicion, and feasibility of surveillance.

A normal intrascrotal supernumerary testis can generally be preserved and followed. A viable malpositioned or abnormally mobile testis may benefit from orchidopexy. A nonviable, severely atrophic, grossly abnormal, or genuinely suspicious gonad may appropriately be removed. Above all, surgery should not create more harm than the anomaly itself.

ETHICAL DECLARATIONS

Peer Review Process

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Conflict of Interest

The authors declare no conflicts of interest.

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REFERENCES

- Bergholz R, Wenke K. Polyorchidism: a meta-analysis. *J Urol*. 2009; 182(5):2422-2427. doi:10.1016/j.juro.2009.07.063
- Balawender K, Wawrzyniak A, Kobos J, et al. Polyorchidism: an up-to-date systematic review. *J Clin Med*. 2023;12(2):649. doi:10.3390/jcm12020649
- Fang H, Wang X, Yu Y, et al. Beyond triorchidism: diagnostic pitfalls and an evidence-driven algorithm for pediatric supernumerary testes. *Eur J Med Res*. 2026;31:333. doi:10.1186/s40001-026-03938-4
- Baltogiannis N, Mavridis G, Keramidas D. Triorchidism associated with cryptorchidism. *Pediatr Med Chir*. 2005;27(1-2):104-105.
- Baltogiannis N, Papandreou E, Faviou E, Christopoulos-Geroulanos G. Triorchidism: conservative or surgical management? *Review Series Urology*. 2007;(3-4):17-19.
- Baltogiannis N, Fili F, Faviou E. Polyorchidism. Atypical presentations of supernumerary testicle can lead to misdiagnosis. *BAOJ Pediat*. 2017; 3:043.
- Nocks BN. Polyorchidism with normal spermatogenesis and equal sized testes: a theory of embryological development. *J Urol*. 1978;120(5):638-640. doi:10.1016/S0022-5347(17)57308-5
- Singer BR, Donaldson JG, Jackson DS. Polyorchidism: functional classification and management strategy. *Urology*. 1992;39(4):384-388. doi:10.1016/0090-4295(92)90220-Q
- Bergholz R, Koch B, Spieker T, Lohse K. Polyorchidism: a case report and classification. *J Pediatr Surg*. 2007;42(11):1933-1935. doi:10.1016/j.jpedsurg.2007.07.031
- Chung TJ, Yao WJ. Sonographic features of polyorchidism. *J Clin Ultrasound*. 2002;30(2):106-108. doi:10.1002/jcu.10031
- Yalçinkaya S, Şahin C, Şahin AF. Polyorchidism: sonographic and magnetic resonance imaging findings. *Can Urol Assoc J*. 2011;5(5):E84-86. doi:10.5489/cuaj.10077
- Danrad R, Ashker L, Smith W. Polyorchidism: imaging may denote reproductive potential of accessory testicle. *Pediatr Radiol*. 2004;34(6): 492-494. doi:10.1007/s00247-003-1120-5
- Ferro F, Iacobelli B. Polyorchidism and torsion. A lesson from 2 cases. *J Pediatr Surg*. 2005;40(10):1662-1664. doi:10.1016/j.jpedsurg.2005.06.029
- Khedis M, Nohra J, Dierickx L, et al. Polyorchidism: presentation of 2 cases, review of the literature and a new management strategy. *Urol Int*. 2008;80(1):98-101. doi:10.1159/000111738



15. Mathur P, Prabhu K, Khamesra HL. Polyorchidism revisited. *Pediatr Surg Int.* 2002;18(5-6):449-450. doi:10.1007/s00383-002-0765-8
16. Artul S, Habib G. Polyorchidism: two case reports and a review of the literature. *J Med Case Rep.* 2014;8:464. doi:10.1186/1752-1947-8-464
17. Savas M, Yeni E, Ciftci H, Cece H, Topal U, Utangac MM. Polyorchidism: a three-case report and review of the literature. *Andrologia.* 2010;42(1):57-61. doi:10.1111/j.1439-0272.2009.00957.x
18. Zahirian Moghadam T, Mohseni Rad H, Zandian H, Hosseinkhani A. Five testicles in the genital area of a thirteen-month-old baby: a case report. *BMC Urol.* 2020;20:128. doi:10.1186/s12894-020-00681-8