Mini Review

Postnatal management of posterior urethral valves: diversion versus ablation versus laser techniques

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Introduction

Posterior urethral valves (PUV) are the most common cause of congenital lower urinary tract obstruction. They remain major burden for long-term renal and bladder morbidity despite advances in antenatal diagnosis and neonatal care.[1–3] Long-term cohort studies have consistently shown that 25–40% of affected boys progress to chronic kidney disease (CKD). 10–15% of boys with PUV eventually develop end-stage renal disease (ESRD).[4–6]

The obstructive pathology of PUV produces a wide clinical spectrum. This may range from mild voiding dysfunction to severe bilateral hydroureteronephrosis, renal dysplasia, and bladder dysfunction.[1,2] The severity and timing of obstruction during fetal life are important predictors for postnatal prognosis. Antenatal obstruction causes irreversible renal and bladder damage, which may persist even after intervention postnatally.[1,2,4,6]

Postnatal management strategies for PUV have evolved considerably over the past several decades. Urinary diversion, valve ablation, laser ablation are the most common interventions used in PUV. urinary diversion are done to rapidly decompress the urinary tract in critically ill neonates. With advances in neonatal anesthesia and endoscopic technology, definitive primary valve ablation became the 1st line of surgical management in stable infants. More recently, laser-based ablation techniques have been introduced as refinements of endoscopic management. This review provides a comprehensive overview of postnatal management strategies for PUV, focusing on primary valve ablation, urinary diversion, comparative outcomes, and laser ablation, with emphasis on techniques, indications, outcomes, and limitations.

Urinary diversion

Urinary diversion is the in selected neonates unsuitable for immediate endoscopic management.

Vesicostomy

Technique.

Vesicostomy involves creation of a low-pressure stoma between the bladder dome and anterior abdominal wall, allowing continuous urinary drainage and rapid decompression of the urinary tract. The surgical techniques include Blocksom vesicostomy, Lapides vesicostomy and latter variations like Button vesicostomy.

Indications.

Critically ill neonates.

Severe renal dysfunction.

Very small urethral caliber.

Limited access to neonatal endoscopy.[7–14]

Outcomes

Duckett emphasized vesicostomy as a life-saving procedure in critically ill infants.[15] Agarwala et al.,[16] reported improvement in renal parameters in >80% of patients following vesicostomy but noted poor bladder compliance in nearly 50% on long-term follow-up.[16] Puri et al., showed that initial diversion was associated with worse long-term bladder outcomes compared with primary ablation.[17] Lukong et al., reported improvement or resolution of hydronephrosis in ~75% of patients managed with vesicostomy in sub-Saharan Africa.[18] Kim et al. confirmed that vesicostomy protects the upper tracts but does not prevent long-term bladder dysfunction.[19]

Limitations

Requirement for subsequent definitive surgery.

Bladder deconditioning.

Stomal complications and caregiver burden.

Ureterostomy (High urinary diversion)

Technique and indications

Cutaneous ureterostomy provides direct upper-tract drainage by bypassing the bladder and is now reserved for extreme cases such as severe bilateral hydroureteronephrosis, hostile bladder, failure of vesicostomy, or progressive renal deterioration.

Outcomes and limitations

Rouzrokh et al. reported preservation or improvement of upper-tract function in ~82% of children undergoing temporary high diversion.[20] Ansari et al., emphasized its role as a salvage procedure in severe PUV.[21] However, ureterostomy carries greater surgical morbidity and risks significant bladder disuse, often necessitating multiple staged procedures.

Primary Valve Ablation: Technique, Indications, and Outcomes

Technique

Primary valve ablation is the cornerstone of postnatal management in hemodynamically stable neonates and infants. The procedure is performed under general anesthesia using neonatal cystoscopes or ureteroscopes (6–9 Fr). Valve leaflets are incised at the 5 and 7 o'clock positions, with or without an additional incision at 12 o'clock, using a cold knife, hook electrode, or Bugbee electrocautery. Low-energy settings and careful avoidance of the external sphincter and bladder neck are essential to minimize complications. Postoperative bladder drainage is usually maintained with a urethral catheter for 24–72 hours.

Indications

Hemodynamically stable neonates and infants.

Absence of severe sepsis or metabolic derangement.

Adequate urethral caliber for safe endoscopic access.

Outcomes

Schober et al., reported improvement in renal parameters in >70% of late-presenting patients following valve ablation.[7] Early intervention has been shown to improve bladder outcomes. Youssif et al. demonstrated abnormal urodynamics in 38% of early-treated children compared with 62% in those undergoing delayed ablation.[8] Menon et al. emphasized that morphological normalization of the posterior urethra after fulguration was a significant prognostic factor for favorable renal outcome.[9]

Neonatal ablation has been shown to be feasible and safe. Dhua et al. reported acceptable short-term outcomes even in neonates presenting with severe obstruction.[10] However, long-term follow-up studies reveal persistent morbidity. Podestá et al., reported bladder dysfunction in approximately 60% of patients despite technically successful ablation.[11] López Pereira et al. and Hutton et al., demonstrated abnormal bladder compliance and detrusor overactivity in 60–70% of patients on long-term follow-up.[12,13] Mallya et al., further showed that earlier age at fulguration was associated with better urodynamic outcomes.[14]

Limitations

Residual valves requiring repeat ablation (10–30%).

Persistent bladder dysfunction despite adequate decompression.

Progressive renal deterioration due to antenatal dysplasia.

Ablation versus diversion a comparative evidence

Comparative studies consistently demonstrate that initial surgical strategy alone does not determine long-term renal outcome. Farhat et al., reported progression to CKD in 25–35% of patients following either primary ablation or diversion.[22] Sarhan et al., showed that nadir serum creatinine was the strongest predictor of long-term renal outcome irrespective of the initial procedure.[2]

Bladder outcomes, however, favor primary ablation. Godbole et al. demonstrated abnormal bladder dynamics in ~60% of vesicostomy patients compared with ~40% after primary ablation.[23] Hosseini et al. reported comparable short-term renal outcomes between early neonatal ablation and vesicostomy.[24]

A systematic review and meta-analysis by Khondker et al. concluded that while renal survival is similar, primary valve ablation is associated with fewer secondary procedures and earlier spontaneous voiding.[25] Current evidence therefore supports primary valve ablation in stable infants, reserving diversion for selected high-risk cases.

Laser Ablation Techniques in Posterior Urethral Valves

Laser ablation has emerged as an alternative to conventional electrocautery fulguration, particularly in neonates with narrow urethras. The holmium:YAG laser is most commonly used due to its shallow tissue penetration (0.3–0.5 mm), allowing precise incision with minimal collateral thermal injury.[26–28]

Laser ablation is performed using a neonatal cystoscope or ureteroscope with a 200–365 μm laser fiber. Valve leaflets are incised at the standard 5 and 7 o'clock positions using energy settings of 0.5–1.0 J at 5–10 Hz, with continuous saline irrigation. Biewald and Schier demonstrated the feasibility and safety of laser ablation in neonates without urethral strictures.[26] Mandal et al., reported outcomes comparable to electrocautery, with residual valve rates of 10–20%.[27] Faure and Boissier highlighted improved precision and reduced bleeding with optimized laser settings.[28] Long-term renal and bladder outcomes appear comparable to conventional techniques, reinforcing that timing of decompression and antenatal pathology remain the dominant determinants of prognosis.[2]

Limitations

Limited availability and higher cost.

Learning curve.

Lack of long-term comparative superiority data.

Conclusion

Postnatal management of posterior urethral valves has evolved from routine urinary diversion to predominantly endoscopic approaches. Primary valve ablation is now the preferred initial treatment in most stable infants. Vesicostomy remains a vital temporizing measure, while ureterostomy is reserved for severe salvage situations. Laser ablation offers technical advantages in selected cases but does not alter the fundamental determinants of long-term outcome. Despite advances in surgical management, renal and bladder morbidity remains substantial, necessitating lifelong follow-up.

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Conflict of interest

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