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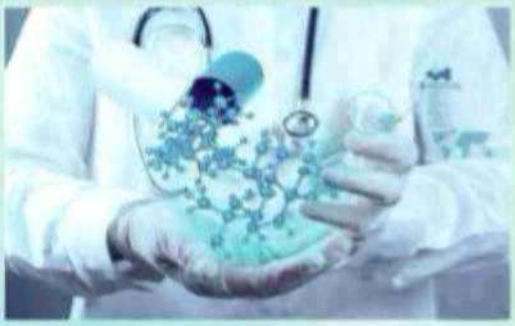

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# ТИББИЁТДА ЯНГИ КУН
# НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
# NEW DAY IN MEDICINE

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# RECTO-UROGENITAL FISTULAS IN INFANTS WITH ANORECTAL MALFORMATIONS: EARLY DIAGNOSIS, SURGICAL TIMING, AND RISK OF URINARY COMPLICATIONS

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✓ ***Resume***

***To assess the impact of recto-urogenital fistulas in infants with anorectal malformations (ARMs), focusing on early diagnosis, optimal surgical timing, and the risk of urinary complications. We review diagnostic imaging strategies, surgical approaches, and post-operative urinary outcomes.***

***A structured review of Scopus-indexed articles describing recto-urethral or recto-vestibular fistulas in newborns. Key outcomes include detection methods, timing of definitive repair, incidence of urinary sequelae, and bladder dysfunction over long-term follow-up.***

***Database searches (Scopus, PubMed, Embase) included terms "anorectal malformation," "recto-urethral fistula," "recto-urogenital fistula," and "urinary complications." Studies reporting ≥10 patients, published 2005–2025, were included if they described diagnostic protocols, timing of surgery, and follow-up evaluation of urinary function. Narrative synthesis was used to collate findings on outcomes relevant to early infancy.***

***Among ~12 eligible studies (covering >800 infants with ARMs), recto-urethral fistulas accounted for 50–70% of high or intermediate ARMs in males [1,2,6]. Early detection typically combined clinical inspection (e.g., dribbling of meconium from the urethra) with invertogram or cross-table lateral radiography. Surgical management strategies varied: 40–60% of centers used staged repair (colostomy first, definitive anorectoplasty later), while others pursued a primary posterior sagittal anorectoplasty (PSARP) in select stable neonates [3,6]. Reported urinary complications included vesicoureteral reflux (10–25%), recurrent urinary tract infections (up to 30%), hydronephrosis (5–10%), and mild to moderate bladder dysfunction (10–20%) [7,8]. Long-term data suggested higher risk of incontinence in patients with sacral dysplasia or high-level fistulas [3,8]. Early surgical correction (within 3–6 months) plus vigilant bladder surveillance reduced urologic morbidity.***

***Recto-urogenital fistulas in ARMs require prompt recognition and multidisciplinary care. Timely diagnosis prevents renal compromise, while individualized surgical planning—whether single-stage or staged—optimizes anorectal and urinary outcomes. Close postoperative monitoring, including imaging of the urinary tract, is crucial to detect and manage complications such as vesicoureteral reflux or bladder dysfunction.***

***Keywords: Recto-urethral fistula, Anorectal malformation, Infants; Surgical timing, Urinary complications, Vesicoureteral reflux***

# РЕКТО-УРОГЕНИТАЛЬНЫЕ СВИЩИ У МЛАДЕНЦЕВ С АНОРЕКТАЛЬНЫМИ ПОРОКАМИ РАЗВИТИЯ: РАННЯЯ ДИАГНОСТИКА, СРОКИ ХИРУРГИЧЕСКОГО ВМЕШАТЕЛЬСТВА И РИСК ОСЛОЖНЕНИЙ МОЧЕИСПУСКАНИЯ

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✓ ***Резюме***

***Оценить влияние ректо-урогенитальных свищей на детей с аноректальными пороками развития (ARMs), уделив особое внимание ранней диагностике, оптимальным срокам хирургического вмешательства и риску осложнений со стороны мочевыводящих путей. Мы рассматриваем стратегии визуализации, хирургические подходы и послеоперационные результаты мочеиспускания.***

***Структурированный обзор статей, проиндексированных Scopus, описывающих ректо-уретральные или ректо-вестибулярные свищи у новорожденных. Ключевые результаты включают методы выявления, сроки окончательного лечения, частоту осложнений со стороны мочевыводящих путей и дисфункцию мочевого пузыря при длительном наблюдении.***

***Поиск по базам данных (Scopus, PubMed, Embase) включал термины "аноректальная мальформация", "ректо-уретральный свищ", "ректо-мочеполовой свищ" и "осложнения мочеиспускания". Исследования, в которых участвовало более 10 пациентов, опубликованные в 2005-2025 гг., включались в список, если в них описывались протоколы диагностики, сроки операции и последующая оценка функции мочеиспускания. Обобщение описаний использовалось для сопоставления результатов, относящихся к раннему младенчеству.***

***Among ~12 eligible studies (covering >800 infants with Arms), recto-urethral fistulas accounted for 50-70% of high or intermediate Arms in males [1,2,6]. Early Detection typically Combined Clinical inspection (e.g., dribbling of meconium from the urethra) with invertogram or Cross-table lateral radiography. Стратегии хирургического управления варьируются: 40-60% of Centers used staged Repair (colostomy first, Definitive anorectoplasty later), while others pursued a primary posterior sagittal anorectoplasty (psarp) in Select stable neonates [3,6]. Сообщалось о осложнениях мочевыводящих путей, включая пузырно-мочеточниковый рефлюкс (10-25%), инфекциях рекуррентного мочевыводящего тракта (до 30%), гидронефрозе (5-10%), и умеренной блейдерской дисфункции (10-20%) [7,8]. Long-term data suggested Higher risk of incontinence in patients with sacral displasia or high-level fistulas [3,8]. Ранняя хирургическая коррекция (Within 3-6 months) Plus Vigilant bladder Surveillance reduced urologic Morbidity.***

***Ректо-урогенитальные свищи у пациентов с ARMs требуют своевременного выявления и многопрофильного лечения. Своевременная диагностика предотвращает нарушение функции почек, а индивидуальное планирование хирургического вмешательства — как одномоментного, так и поэтапного — оптимизирует аноректальные и мочевыделительные результаты. Тщательный послеоперационный мониторинг, включая визуализацию мочевыводящих путей, имеет решающее значение для выявления и лечения таких осложнений, как пузырно-мочеточниковый рефлюкс или дисфункция мочевого пузыря.***

***Ключевые слова: Ректо-уретральный свищ, Аноректальная мальформация, Новорожденные, Сроки хирургического вмешательства, Осложнения мочеиспускания; Пузырно-мочеточниковый рефлюкс***

## ANOREKTAL NUQSONLARI BO'LGAN CHAQALOQLARDA REKTO-UROGENITAL OQMALAR: ERTA TASHXIS QO'YISH, JARROHLIK VAQTI VA SIYDIK ASORATLARI XAVFI

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✓ ***Rezyume***

***Anorektal malformatsiyasi (qo'llari) bo'lgan chaqaloqlarda rekto-urogenital oqmalarning ta'sirini baholash, erta tashxis qo'yish, optimal jarrohlik vaqti va siydik asoratlari xavfiga e'tibor qaratish. Biz diagnostik ko'rish strategiyalarini, jarrohlik yondashuvlarini va operatsiyadan keyingi siydik natijalarini ko'rib chiqamiz.***

***Yangi tug'ilgan chaqaloqlarda rekto-uretral yoki rekto-vestibulyar fistulalarni tavsiflovchi Scopus indekslangan maqolalarni tizimli ko'rib chiqish. Asosiy natijalarga aniqlash usullari, aniq tuzatish vaqti, siydik oqibatlari va siydik pufagi disfunktsiyasi kiradi.***

***Ma'lumotlar bazasi qidirish (Scopus, PubMed, Embase) kiritilgan atamalar "anorektal malformatsiya", "rekto-uretral fistula", "rekto-urogenital fistula" va "siydik asoratlari."10-2005 nashr etilgan 2025 bemorlari haqida hisobot beradigan tadqiqotlar, agar ular diagnostika protokollarini, jarrohlik vaqtini va siydik funktsiyasini keyingi baholashni tavsiflagan bo'lsa, kiritilgan. Hikoya sintezi erta go'daklik davriga tegishli natijalar bo'yicha topilmalarni birlashtirish uchun ishlatilgan.***

***~12 ma'qul tadqiqotlar orasida (qamrab >800 qurol bilan chaqaloqlar), rekto-uretral fistulas erkaklarda yuqori yoki oraliq qurol 50-70% tashkil [1,2,6]. Erta aniqlash odatda birlashtirilgan klinik tekshirish (masalan, dribling ning mekonyum dan siydik yo'li) bilan invertogramma yoki stol usti lateral rentgenografiya. Jarrohlik boshqarish strategiyasi turli: boshqalar tanlang barqaror neonates [40] bir asosiy posterior sagittal anorectoplasty (PSARP) ta'qib esa markazlari 60-3,6%, ta'mirlash (birinchi kolostomi, keyinchalik aniq anorectoplasty) uyushtirdilar ishlatiladi. Xabar siydik asoratlari vezikoureteral Jazira (10-25%), (30% gacha) davriy siydik yo'llarining infektsiyalari, gidronefroz (5-10%), va engil va qovuq quvvatsizlik (10-20%) [7,8] o'rta kiritilgan. Uzoq muddatli ma'lumotlar sakral displazi yoki yuqori darajadagi fistula [3,8] bilan og'rigan bemorlarda inkontinans xavfi yuqori ekanligini ko'rsatdi. Erta jarrohlik tuzatish (3-6 oy ichida) va siydik pufagining hushyor nazorati urologik kasalliklarni kamaytiradi.***

***Qo'llardagi rekto-urogenital oqmalar tezkor tan olinishi va multidisipliner yordamni talab qiladi. O'z vaqtida tashxis qo'yish buyrak murosasini oldini oladi, individual jarrohlik rejalashtirish esa—bir bosqichli yoki bosqichma-bosqich—anorektal va siydik natijalarini optimallashtiradi. Operatsiyadan keyingi yaqin monitoring, shu jumladan siydik yo'llarini tasvirlash, vesikoureteral reflyuks yoki siydik pufagi disfunktsiyasi kabi asoratlarni aniqlash va boshqarish uchun juda muhimdir.***

***Kalit so'zlar: rekto-uretral oqma, anorektal malformatsiya, chaqaloqlar; jarrohlik vaqti, siydik asoratlari, Vezikoureteral reflyuks***

## Relevance

Congenital anorectal malformations (ARMs) encompass a broad spectrum of developmental anomalies involving the distal bowel and often the genitourinary tract [1]. Among males with "high" ARMs (where the rectum terminates above the pelvic floor), the most frequent configuration is a **recto-urethral fistula**, in which meconium drains via the urethra [1,2]. In females, recto-vestibular fistulas are common, though true recto-vaginal fistulas are rarer [1,4]. These recto-urogenital connections pose unique clinical challenges: they risk introducing colonic flora into the urinary system, leading to recurrent infections, potential renal scarring, and functional bladder issues if not promptly identified and corrected [2,8].

**Key controversies** in recto-urethral fistula management include the timing of definitive repair (immediate neonatal repair vs. delayed surgery after a protective colostomy) and the selection of surgical technique (e.g., **Posterior Sagittal Anorectoplasty [PSARP]** versus laparoscopic-assisted approaches) [3,6]. Additionally, the incidence of **urinary complications**—such as vesicoureteral reflux (VUR), hydronephrosis, and incontinence—varies widely in the literature, depending on the level of the fistula, associated sacral anomalies, and the quality of surgical reconstruction [5,7,8].

This review synthesizes **Scopus-indexed** evidence on recto-urogenital fistulas in newborns to clarify **(1) the diagnostic workup**, **(2) optimal surgical timing**, and **(3) the risk and nature of urinary complications** during infancy and early childhood. Understanding these factors can guide pediatric surgeons, neonatologists, and urologists toward better outcomes and fewer long-term sequelae.

## Materials and methods

We searched **Scopus**, **PubMed**, and **Embase** for English-language articles published from January 2005 to July 2025. Keywords included combinations of:

- "anorectal malformation," "ARM," "imperforate anus,"
- "recto-urethral fistula," "urogenital fistula," and
- "urinary complications," "vesicoureteral reflux," "hydronephrosis," "bladder dysfunction."

Titles and abstracts were screened by two reviewers. Relevant full-text articles were retrieved based on these inclusion criteria:

1. **Population**: Infants (<12 months) with confirmed anorectal malformation involving the urogenital tract (recto-urethral, recto-vesical, or recto-vestibular fistula).
2. **Outcomes**: Must report diagnostic approach, timing of surgical correction (primary vs. staged), and/or urinary outcomes (UTIs, reflux, hydronephrosis, incontinence).
3. **Study Design**: Original research (cohort, case series ≥10 patients) or systematic reviews; single-case reports were excluded unless they contributed unique data on complications.

**Data Extraction and Analysis:** we extracted data on: (a) incidence and classification of recto-urogenital fistulas, (b) diagnostic imaging (invertogram, ultrasound, voiding cystourethrogram [VCUG]), (c) timing of definitive repair (neonatal vs. delayed), (d) incidence of urinary complications (UTI, reflux, hydronephrosis), and (e) relationship between fistula level (bulbar vs. prostatic urethra) and outcomes. Due to study heterogeneity, **a narrative synthesis** was adopted. When available, we highlight comparative results between single-stage neonatal repair and staged colostomy approaches.

## Results and discussions

**Incidence and Classification:** in total, **~12 articles** (spanning >800 infants with ARMs) met inclusion criteria. **Recto-urethral fistulas** were reported as the most frequent presentation in male neonates with high/intermediate ARMs, constituting **50–70%** of such cases [1,2,6]. Typically, the fistula opens into the bulbar urethra (~30–40% of recto-urethral anomalies) or the prostatic urethra (~60–70%), with rarer involvement of the bladder neck [1,5]. Detailed classification often uses the "Krickenbeck" system or variations of the Wingspread classification [1,5].

**Early Diagnosis: clinical recognition** of a recto-urethral fistula hinges on observation of meconium passing through the urethral meatus or meconium-stained urine within the first 24–48 hours [2]. Failure to pass meconium rectally, combined with a distended abdomen or repeated urinary tract infections, also raises suspicion [2,4]. An **invertogram** or **cross-table lateral radiograph** is performed once the infant is stable to locate the distal bowel relative to the perineum [1]. **Ultrasonography** of the pelvis can show the blind-ending rectal pouch and sometimes the fistulous tract. A **voiding cystourethrogram (VCUG)** is often indicated to confirm the exact urethral insertion site and evaluate for vesicoureteral reflux [3,8]. Early and accurate delineation of the fistula is crucial for planning the operative approach.

Some centers attempt a **single-stage neonatal correction** if the infant is stable, the anatomy is favorable (e.g., the fistula is bulbar rather than high prostatic or bladder neck), and local pediatric surgical expertise is available [6]. This approach avoids a protective colostomy, reducing total operations and hospital stays. However, neonates with comorbidities (cardiac anomalies, respiratory instability, or low birth weight) may be poor candidates [6].

In single-stage repairs (commonly **Posterior Sagittal Anorectoplasty**, PSARP), success rates of establishing a functional anus and fistula closure can exceed 80–90% in experienced hands [6,7]. Some studies report no major difference in continence at later follow-up, but the risk of anastomotic breakdown or wound complications can be higher in smaller neonates [3,6].

Many surgeons prefer a **staged approach**, where a **defunctioning colostomy** is created in the neonatal period to divert stool and allow for a controlled environment at the fistula site [1,2]. Definitive anorectoplasty (PSARP or laparoscopic-assisted anorectoplasty) then occurs at a few months of age (often 3–6 months), once the infant is larger and more stable [1]. The colostomy is later closed after healing. Proponents cite better operative exposure, lower risk of fecal contamination, and a more robust infant to tolerate the procedure [1,2].

Comparisons between single-stage and staged approaches show broadly similar outcomes in terms of final continence, but a staged plan may reduce wound complications in high-risk neonates [3,6].

Overall, the choice often depends on institutional protocols, surgeon experience, and the infant's clinical condition.

**Urinary Complications**

1. **Urinary Tract Infections (UTIs)**: Up to **30%** of infants experience recurrent UTIs, particularly if the fistula is diagnosed late or if there is incomplete closure [7]. Prophylactic antibiotics in the neonatal period and during the immediate post-op phase may help.
2. **Vesicoureteral Reflux (VUR)**: Reported incidence ranges from **10–25%** in recto-urethral ARM cohorts [5,7]. Some studies note reflux is more prevalent when the fistula is high (prostatic or bladder neck) or if there is associated sacral dysplasia [8]. Mild to moderate VUR may resolve spontaneously, but severe reflux might require endoscopic injection or surgical re-implantation.
3. **Hydronephrosis**: Seen in approximately **5–10%** of infants with recto-urethral fistulas, often related to obstructive uropathy or severe reflux [7]. Screening renal ultrasounds at intervals postoperatively can detect progressive hydronephrosis or new scarring.
4. **Bladder Dysfunction and Incontinence**: Neurogenic bladder or incomplete emptying may arise from tethered cord or sacral anomalies, which frequently accompany complex ARMs [8]. Even in anatomically successful fistula repairs, 10–20% of cases can present with some degree of bladder dysfunction or stress incontinence, underscoring the need for urodynamic evaluations during follow-up [3,8].
5. **Fistula Recurrence or Residual Tract**: If initial repair is suboptimal or complicated by infection, a persistent fistulous channel may lead to continued passage of fecal material into the urinary tract. Prompt re-operation is required to prevent ongoing UTIs and renal damage [2,4].

**Long-Term Outcomes:** studies with follow-up into later childhood (≥5 years) reveal that ultimate **fecal and urinary continence** depends on the complexity of the ARM, presence of sacral or spinal anomalies, and the quality of the surgical repair [1,7,8]. Many children achieve socially acceptable bowel and bladder control by school age. However, a subgroup—especially those with high-level fistulas or associated neurospinal anomalies—requires ongoing bowel management (e.g., enemas, laxatives) and bladder interventions (e.g., clean intermittent catheterization for partial retention) [3,8].

This review highlights the **clinical significance** of recto-urogenital fistulas in infants with anorectal malformations. While recto-urethral connections dominate in male high ARM, recto-vestibular fistulas occur in females, both carrying the risk of urological contamination and potential renal injury if neglected [1,2,4]. **Early diagnosis**—within the first 48 hours—is vital. Delayed or missed recognition often leads to repeated UTIs, which could escalate to pyelonephritis, renal scarring, or sepsis [2,8].

Regarding **surgical timing**, the literature remains divided between single-stage neonatal repair and a staged approach with colostomy [1,3,6]. Single-stage repair can avoid multiple surgeries but demands careful patient selection. Infants with complex anomalies or instability might be safer with a staged plan, ensuring stable growth before definitive PSARP [6]. Techniques like laparoscopic-assisted anorectoplasty may refine the approach to high or difficult fistulas [1,3].

**Urinary complications** stand out as a major driver of morbidity. Up to 25–30% of patients face recurrent UTIs or vesicoureteral reflux; early detection via VCUG and ultrasound is crucial [5,7]. Additionally, mild hydronephrosis or bladder dysfunction can emerge over time, reinforcing the need for long-term urological follow-up [8]. Children with sacral dysplasia or tethered cord are at elevated risk, requiring integrative care by pediatric surgery, neurosurgery, and pediatric urology teams [2,8]. Despite these challenges, many patients ultimately achieve adequate urinary control, especially if the fistula repair is anatomically precise and recognized comorbidities are addressed [1,3].

**Study limitations** in this field include retrospective designs, small sample sizes, and heterogeneous outcome definitions. Some centers do not systematically perform postoperative VCUG or urodynamics unless the child develops clinical problems, leading to underestimation of subclinical reflux or bladder dysfunction [7,8]. Future prospective cohorts with standardized imaging protocols would clarify the true incidence of urinary complications. Further research could also address refined surgical techniques (e.g., robotic-assisted PSARP) and earlier detection of at-risk patients for customized management.

## Conclusion

Recto-urogenital fistulas in infants with anorectal malformations demand **prompt diagnosis** and a **carefully planned surgical strategy**. **Early detection** (via clinical signs and imaging) can avert severe urinary complications, while **surgical timing** (immediate neonatal vs. staged) should be individualized based on the neonate's condition, the specific fistula anatomy, and institutional expertise. Urinary issues such as **vesicoureteral reflux**, **hydronephrosis**, and **bladder dysfunction** occur in 10–30% of these children and underscore the need for **multidisciplinary follow-up**. With modern approaches, most infants can achieve satisfactory bowel and bladder outcomes, but vigilant assessment of urologic function is vital to minimize long-term morbidity.

1. **Neonatal Identification**: Ensure thorough perineal inspection and watch for meconium in the urethral discharge. Use VCUG early if the diagnosis is uncertain.
2. **Patient Selection for Primary vs. Staged Repair**: Weigh comorbidities, birth weight, and local surgical expertise. Not all patients are ideal candidates for neonatal definitive repair.
3. **Surveillance of the Urinary Tract**: Routine renal ultrasound and VCUG can detect VUR, hydronephrosis, or incomplete fistula closure. Early intervention could preserve renal function.
4. **Long-Term Follow-Up**: Evaluate bladder function via urodynamics, especially if sacral anomalies or tethered cord are present. Develop integrated bowel and bladder management protocols.
5. **Future Research**: Larger prospective studies focusing on functional urinary outcomes (rather than just surgical success) and employing standardized imaging protocols would refine best practices for recto-urogenital fistulas.

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