Minimally Invasive Surgery in the Management of Anorectal Malformations

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KEYWORDS

- Imperforate anus • Anorectal malformation (ARM)
- Posterior sagittal anorectoplasty (PSARP)
- Laparoscopic-assisted anorectal pull-through (LAARP) • Minimally invasive surgery
- Congenital anomalies

KEY POINTS

- Anorectal malformations (ARMs) are common and often associated with other congenital anomalies. There are several different configurations of ARM seen in the neonatal population, with incidence often varying with the presence of associated anomalies.
- The type of repair performed, including laparoscopic-assisted anorectal pull-through and posterior sagittal anorectoplasty, largely depends on surgeon preference, experience, and type of anomaly.
- Further research is needed on long-term functional outcomes of laparoscopic-assisted versus traditional repair of ARM because results may be attributed to the type of ARM and location of the fistula more than the surgical technique.

INTRODUCTION

Imperforate anus, a variant of anorectal malformation (ARM), has been well documented in the medical literature since antiquity, when a variety of crude techniques were used to create an orifice in the perineum.[1] ARM occurs in 1 out of every 4000 to 5000 newborns, with a slightly higher rate among boys.[2] Most ARMs result in absent or abnormal anal orifice and are associated with rectourethral or perineal fistula. A small group of patients have a blind-ending pouch (rectal atresia) without fistula.[3,4] The type of ARM and associated genitourinary anomalies vary with gender such that the most frequently reported ARM in male patients is imperforate anus with a rectourethral fistula. In female patients, rectovestibular fistula and perineal fistulas are reported most

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commonly.[5] Imperforate anus without a fistula accounts for only approximately 5% of all ARMs and is most likely to be associated with Down syndrome.[6] Historically ARMs, and specifically imperforate anus, were described as low, intermediate, or high, in an attempt to describe the space between the supralevator muscle complex and the distal rectum (**Table 1**). This classification was used to guide therapy, whereas traditional perineal approaches were applied to low and occasionally intermediate defects. In contrast, abdominal approaches are often required for high or unknown defects. Of note, there is a higher incidence of associated vertebral, spinal, and genitourinary anomalies in patients with a very high defect compared with lower ones.[7,8]

Compared with other congenital intestinal anomalies, ARM is more often associated with other anomalies, which seems to influence the type of defect and work-up performed. In particular, ARM may be present in up to 90% of patients with the VACTERL (vertebral anomalies, anal atresia, cardiac malformations, tracheoesophageal fistula with or without esophageal atresia, renal dysplasia, and limb [often radial] anomalies) association.[2,5] VACTERL, a nonrandom co-occurrence of congenital malformations affecting between 1 in 10,000 and 1 in 40,000 live births, includes 3 component features and the absence of an encompassing diagnosis.[9,10] In particular, vertebral anomalies are the most frequently associated defect with ARMs with the severity of spinal or vertebral anomaly often correlating with overall prognosis.[11] Regardless of spinal deformity, ARMs present a unique management dilemma based on the wide variety of presentations and frequently associated genitourinary anomalies reported in up to 55% to 90% of affected patients.[12,13]

The posterior sagittal anorectoplasty (PSARP), first described by Peña and Devries[36] in the 1980s, is still considered the mainstay of therapy for ARM by many pediatric surgeons. The technique, in line with the classification of ARMs, has evolved over the past 3 decades, continuing to reflect the principles of managements that Peña and Devries[36] described.[14,15] Taking the early lessons from Peña and Devries[36] into account, understanding of the functional outcomes, risks, and benefits of various surgical techniques has continued to evolve. Perhaps most importantly, advances in neonatal medicine and laparoscopic technology have made minimally invasive abdominal approaches to ARM a reality.

Laparoscopic-assisted anorectal pull-through (LAARP) was first described and popularized by Georgeson and Inge[17] in 2000, building on prior experience with laparoscopic treatment of Hirschsprung disease.[16,17] Based on a growing body of

Table 1
Wingspread classification of anorectal malformations (1984)

	Male	Female
High	• Anorectal agenesis • With rectoprostatic urethral fistula • Without fistula • Rectal atresia	• Anorectal agenesis • With rectovaginal fistula • Without fistula • Rectal atresia
Intermediate	• Rectobulbar-urethral fistula • Anal agenesis without fistula	• Rectovestibular fistula • Rectovaginal fistula • Anal agenesis without fistula
Low	• Anocutaneous fistula • Anal stenosis	• Anovestibular fistula • Anocutaneous fistula • Anal stenosis
Rare Malformations		• Cloaca

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