Case Report

Currarino Syndrome: Report of Two Cases and Review of the Literature

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In the present paper the authors examine two cases of Currarino syndrome and review the existing literature on the disease. Both cases presented with chronic constipation. The first concerns a two year old male born with anorectal stenosis and diagnosed with Currarino syndrome when scimitar sacrum and anterior meningocele were finally detected. The second concerns a 25 year old female who suffered from chronic constipation but was not diagnosed until thorough examination revealed ectopic anus with Hirschsprung's disease, scimitar sacrum and anterior meningocele. Because these patients were not diagnosed with Currarino syndrome when first seen, the authors reviewed its prevalence, embryogenesis, clinical manifestations, diagnosis and treatment. The authors' research supports the significance of prompt diagnosis in effective treatment and reduction of morbidity.

Keywords: *Currarino syndrome, Currarino's triad, Anterior meningocele*

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Currarino syndrome is a form of caudal regression syndrome specifically characterized by a triad of sacrococcygeal defect, anorectal malformation and presacral mass. The most common presenting symptom is intractable constipation in infants and young children due to anorectal stenosis, extrinsic compression of the presacral mass and various neurological factors. Though Currarino syndrome is thought to be rare, its accurate incidence is yet unknown. Unfortunately, it appears that lack of early diagnosis causes serious complications for those who suffer from Currarino syndrome. Here, the authors report two such cases.

Case Report

Case 1

A male infant with anorectal stenosis was initially treated at a hospital where he was born. In the first few days of life he underwent anoplasty but was still affected by severe constipation due to anal stricture. The child received repeated rectal irrigations and anal dilatations. He was first referred to our hospital at two years of age. Upon further examination of his condition, plain radiography showed scimitar shaped sacrum (a sacrococcygeal defect that looks like a short curved sword with one sharp edge, used especially in eastern countries) (Fig. 1a). Pelvic ultrasonography detected a 6.2 x 2.8 cm presacral cystic mass. Spinal MRI demonstrated anterior sacral meningocele with tethered spinal cord (Fig. 1c). Neurosurgical treatment obtained anterior sacral meningocele repair and release of spinal cord tethering. Post anoplasty, he received anal dilations and is still followed in our outpatient clinic. When the authors reported this case, he was two years and six months old.

Case 2

A 25 year old female born with chronic constipation went to several hospitals, irregularly, due to financial problems. She used laxative drugs and enema kits regularly. When she was fifteen, she underwent an operation at a hospital but does not remember the specifics of the operation. Her symptom slightly improved but she continued taking laxative drugs. One month

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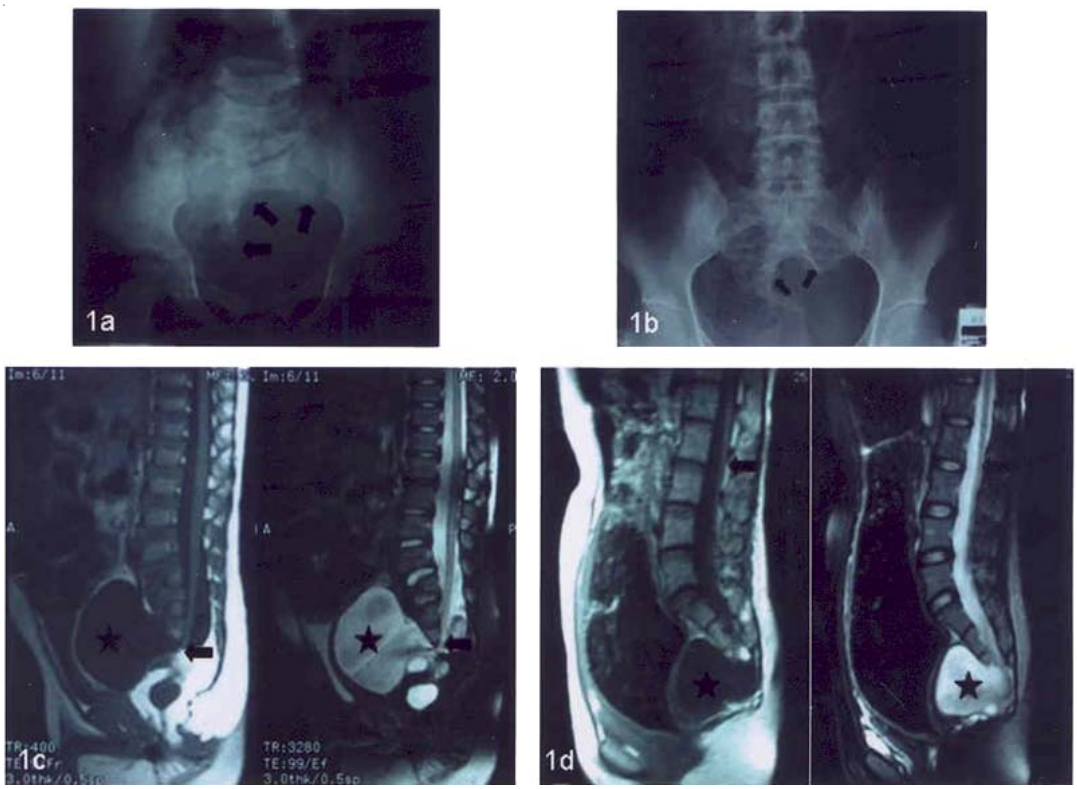

Fig. 1a, 1b Plain radiographs show scimitar shaped sacrum (arrow)
Fig. 1c MRI of the spinal cord shows the low lying and tethered spinal cord at anteroinferior of the spinal canal (arrow) and anterior sacral meningocele passes through sacral bony defect (star)
Fig. 1d MRI of the spinal cord shows the low lying and tethered spinal cord at posterior of the spinal canal (arrow) and anterior sacral meningocele (star**)**

before admission to our hospital, she did not menstruate and so went to a private hospital. She was diagnosed with a brighted ovum and underwent cervix dilatation and curettage. Pelvic ultrasonography revealed an 8 x 6 cm cystic mass in the presacral area and she was subsequently referred to our hospital.

Physical examination showed an ectopic anus. Plain radiography revealed a scimitar shaped sacrum (Fig 1b). MRI of the spine demonstrated anterior sacral meningocele with a tethered spinal cord (Fig 1d). Rectal punch biopsy confirmed Hirschsprung's disease and the patient underwent anterior sacral meningocele repair and release of spinal cord tethering. The authors planned to perform subtotal colectomy and relocation of the anus. At the time the case was reported, the patient was on a waiting list for these procedures.

Discussion

The Currarino triad is also known as the ASP association, a triad of Anorectal malformation (ARM), Sacral bony defect, and Presacral mass. Although this triad was described by Kennedy[1] as early as 1926, it was not until 1981 that Currarino et al[2] recognized these disorders as an unique complex of anomalies. In Currarino's first report, all three infants had a congenital anorectal stenosis associated with a sacral defect and a presacral mass. The mass was an anterior meningomyelocele in the first case, a teratoma in the second, and an enteric cyst in the third.

There are several names used to describe this disorder. Some authors have used the term Currarino triad, others have described the syndrome as ASP, others as hereditary sacral agenesis or Currarino syndrome. The disorder has great variability in phenotype[3,4]. Many cases present asymptomatic hemisacrum without other anomalies, but others present a complete spectrum of malformation and other associated anomalies. Because of this great variability, the name Currarino syndrome (CS) is more appropriate than Currarino triad. The actual incidence of CS is not well

defined. It has been diagnosed in approximately 200+ recorded cases. The age range at presentation varies from birth to 64 years[4]. More than 80% of complete CS cases are diagnosed in the first decade of life, whereas incomplete CS is diagnosed predominantly in adults[1,5,6]. It is more likely to occur in females than males at a ratio of 2:1[4].

Patients present with a wide spectrum of signs and symptoms. The most common presenting symptom is constipation[4,7]. Several reports have also mentioned recurrent perianal sepsis, recurrent urinary tract infection, bacterial meningitis, spinal epidural abscess, spinal cord tethering, neurogenic bladder, gynecological abnormalities, low back pain, nausea, headache and dystocia[4,5,7-18]. Patients present with constipation of variable severity, which may result from a combination of compression by the presacral mass, neurogenic dysfunction and ARM itself[5,6,11,19,20,21]. Different types of ARM, such as anorectal stenosis, imperforate anus, rectoperineal fistula, rectovestibular fistula and rectovaginal fistula can be present in CS but anorectal stenosis is found to be the most common ARM[9,20]. The sacral bony defect can be a total sacral agenesis or a partial asymmetric deformity of the sacrum with a scimitar shape. The common presacral masses are anterior meningocele and benign teratoma. The other pathologies that have been reported worldwide are enteric cyst, dermoid cyst, lipoma, leiomyosarcoma, epidermoid cyst, lipomyelomeningocele and hamartoma[4,22,23]. There have been reports of patients with dual pathology (both meningocele and teratoma) in the presacral mass[24]. The malignant degeneration of presacral teratoma is rare, but there have been reports of this condition as well[22,25-27]. There are other associated malformations involving the spinal cord, urinary system, gynecological system and enteric nervous system (Table 1). Martucciello et al[28] classified CS as 3 different types; (1) Complete CS, CS with full expressivity (hemi-sacrum, ARM and presacral mass); (2) Mild CS, hemi-sacrum and only 1 of the other malformations, i.e., ARM or presacral mass; and (3) Minimal CS, in which only the hemi-sacrum is present. Still, constipation is often due to association with neural tube defect, particularly tethered cord, in even minimal CS. With any type of CS, associated anomalies should be considered.

Several explanations have been reported for the embryogenesis of this syndrome. Currarino et al[2] proposed that in early fetal life, abnormal endoectodermal adhesion or anomalies of the notochord may cause a failure of the mesodermal fusion in the midline.

Table 1. Malformation of different organ systems observed in Currarino syndrome

Organ system	Malformation
Spinal cord	tethered spinal cord, lipoma of filum terminale, hydromyelia
Urinary system	duplex ureter, horseshoe or duplex kidney, hypospadias
Gynecological system	bicornuate uterus, duplex uterus septate vagina, hemi-vagina, bifid clitoris
Enteric nervous system	Hirschsprung's disease, dysganglionoses

This prevents anterior vertebral fusion and results in a connection between the gut and the spinal column. This is considered to be in the spectrum of the "split notochord syndrome" and partial resorption of this connection would form an anterior sacral meningocele or a retrorectal enteric cyst[29,30]. The combination of mesodermal tissue with these enteric and neuroectodermal elements lead to the formation of a presacral teratoma[5,11,31,32]. Current knowledge of embryology refutes Currarino's explanation of this disorder, it is now known that the lower sacrum and the rectal elements are products of the caudal cell mass[31].

A familial tendency was noted in some early case reports. At least one half of the patients with CS have a family member who also suffers from CS[5,11,20,26,32]. The underlying gene defect was localized to chromosome 7q36 by Lynch et al in 1995[33]. In 2000, a causative gene for CS was identified as the ***HLXB9*** homeobox gene on chromosome 7q36. The same gene was tested in patients with other aspects of caudal regression syndrome and no mutation was found[34]. Mutations in the coding sequence of ***HLXB9*** have been identified in nearly all cases of familial CS and in approximately 30% of patients with sporadic CS[35-38].

Rectal examination followed by sacrococcygeal radiography allows simple and early recognition of this pathology. Martucciello et al[28] proposed a diagnostic protocol for CS. A plain radiography of the sacrum is the first diagnostic step, as it is indicative in every member of CS families, in suspect caudal regression syndrome, in every case of ARM, in children with unexplained severe constipation and when a presacral mass has been diagnosed. The urinary tract should be studied in every CS patient by ultrasonography, which

also provides information on gynecological malformations in women. In cases where radiographic or clinical suspicious of vesicouretery reflux are present, voiding cystourethrography should be performed. Due to reports of demonstrated Hirschsprung's disease in CS patients, some investigators assert that rectal biopsy is mandatory to rule out Hirschsprung's disease and other dysganglionoses[28,35]. Though presacral mass is well visualized by ultrasonography, MRI is better at demonstrating its extent and morphological components as well as any evidence of other intraspinal anomalies (e.g. intraspinal lipoma or tethered spinal cord)[39,40].

Treatment differs according to the expressivity of CS. In complete CS, many investigators suggest that colostomy should be done first. A posterior sagittal anorectoplasty (PSARP) provides an excellent approach for the treatment of any ARM or presacral mass[41]. If the presacral mass is anterior meningocele, neurosurgery is required and PSARP should be performed at a subsequent stage[11,21,28,35]. Colostomy closure is generally the final step. Some investigators suggest one stage treatment of anterior meningocele and ARM after colostomy but this approach is dangerous in risk of infection. In the case of incomplete CS, such as hemisacrum and ARM, primary PSARP can be performed. If preoperative rectal biopsy is positive for Hirschsprung's disease or dysganglionoses, resection of the affected segment should be done with PSARP[28].

All first degree relatives should be offered a sacral radiography[4]. Relatives with an abnormal radiography should be referred to a surgeon for further examination for a possible occult presacral mass.

Conclusion

CS is a rare autosomal dominant disorder. Patients are at risk for serious complications like bacterial meningitis, perianal sepsis, tethered cord syndrome, which can lead morbidity and mortality. This syndrome is often overlooked because it is not universally known. Neither of the presented cases was diagnosed with CS early in their treatment. It is important to keep this syndrome in mind when faced with infants and children with constipation associated with ARM. Prompt diagnosis and treatment can help minimize the morbidity.

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กลุ่มอาการเคอราริโน: รายงานผู้ป่วย 2 ราย และทบทวนวรรณกรรม

จิระพร อมรฟ้า, ช่อเพียว เตโชฬาร, สุรชัย เคารพธรรม

คณะผู้จัดทำได้นำเสนอผู้ป่วย 2 ราย ซึ่งมีอาการท้องผูกเรื้อรัง ผู้ป่วยรายแรกเป็นเด็กชายอายุ 2 ปี ตรวจพบมีการตีบตันของทวารหนักและไส้ตรง, กระดูกกระเบนเหน็บและก้นกบผิดรูป มีลักษณะคล้ายเคียว และถุงเยื่อหุ้มไขสันหลังยื่นผ่านกระดูกกระเบนเหน็บออกมาทางด้านหน้า ผู้ป่วยรายที่ 2 เป็นผู้หญิงอายุ 25 ปี ตรวจพบช่องทวารหนักอยู่ผิดที่, Hirschsprung's disease, กระดูกกระเบนเหน็บและก้นกบผิดรูป มีลักษณะคล้ายเคียว และถุงเยื่อหุ้มไขสันหลังยื่นผ่านกระดูกกระเบนเหน็บออกมาทางด้านหน้า ในระยะแรก ผู้ป่วยทั้ง 2 ราย มีอาการท้องผูกและรูปวิปริตของทวารหนักและไส้ตรง แต่ไม่ได้รับการตรวจหาโรคร่วมอื่น และ ไม่ได้รับการวินิจฉัย กลุ่มอาการเคอราริโน ดังนั้นคณะผู้จัดทำจึงได้ทบทวนบทความวิชาการเกี่ยวกับ อุบัติการณ์, กลไกการเกิดโรค, อาการและการแสดง, การวินิจฉัยโรค และ การรักษา ซึ่งพบว่าการวินิจฉัยโรคนี้ได้รวดเร็วในระยะแรก จะช่วยให้ได้รับการรักษาที่เหมาะสม และ ลดอัตราพิการ และ อัตราตายได้