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Case Report

Currarino syndrome in an elderly man: Multimodality imaging findings ☆,☆☆

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ABSTRACT

Currarino syndrome is a rare congenital disorder characterized by the triad of anorectal anomalies, sacrococcygeal dysgenesis and presacral mass. Because of the anorectal anomalies, the extrinsic compression due to the presacral mass and neurologic deficits, patients usually present with gastrointestinal symptoms, most commonly chronic constipation. Most cases of Currarino syndromes are diagnosed in childhood, at birth or in the pre-birth period and, even if adult presentation has been reported in few sporadic case reports, the diagnosis in the late stages of life remains extremely rare. In this paper, we describe the imaging findings of an elderly man with a past medical history of megacolon surgically treated in his childhood, who was diagnosed with Currarino syndrome at the age of 72.

Introduction

The Currarino syndrome (CS; OMIM #176450) is a rare congenital disorder first described in 1981 by a pediatric radiologist, Guido Currarino [1], characterized by the triad of anorectal anomalies, sacrococcygeal dysgenesis and presacral mass. Although sacrococcygeal anomalies are usually present, the triad is often incomplete and a mild, moderate, and severe clinical phenotype can often be recognized [2,3].

Anterior meningocele represents the most frequent presacral mass entity though teratomas, lipomas, dermoid cysts, hamartomas, or enteric duplication cysts have been reported in literature and, in some cases, an association of more than one type of mass has been documented [4,5].

CS is considered an autosomal dominant trait [6], with reduced penetrance and variable expressivity, but sporadic cases have also been reported [2,7]. Mutations in HLXB9 gene, renamed motor neuron and pancreas homeobox 1 (MNX1; HGNC ID: 4979, GenBanK: NM_005515.3) and mapped to 7q36, have been found in nearly all familial CS cases and in approximately 30% of CS sporadic patients [2,3,8]. Although the embryogenetic role of MNX1 gene is not completely clear, it encodes a homeobox nuclear transcription factor involved in

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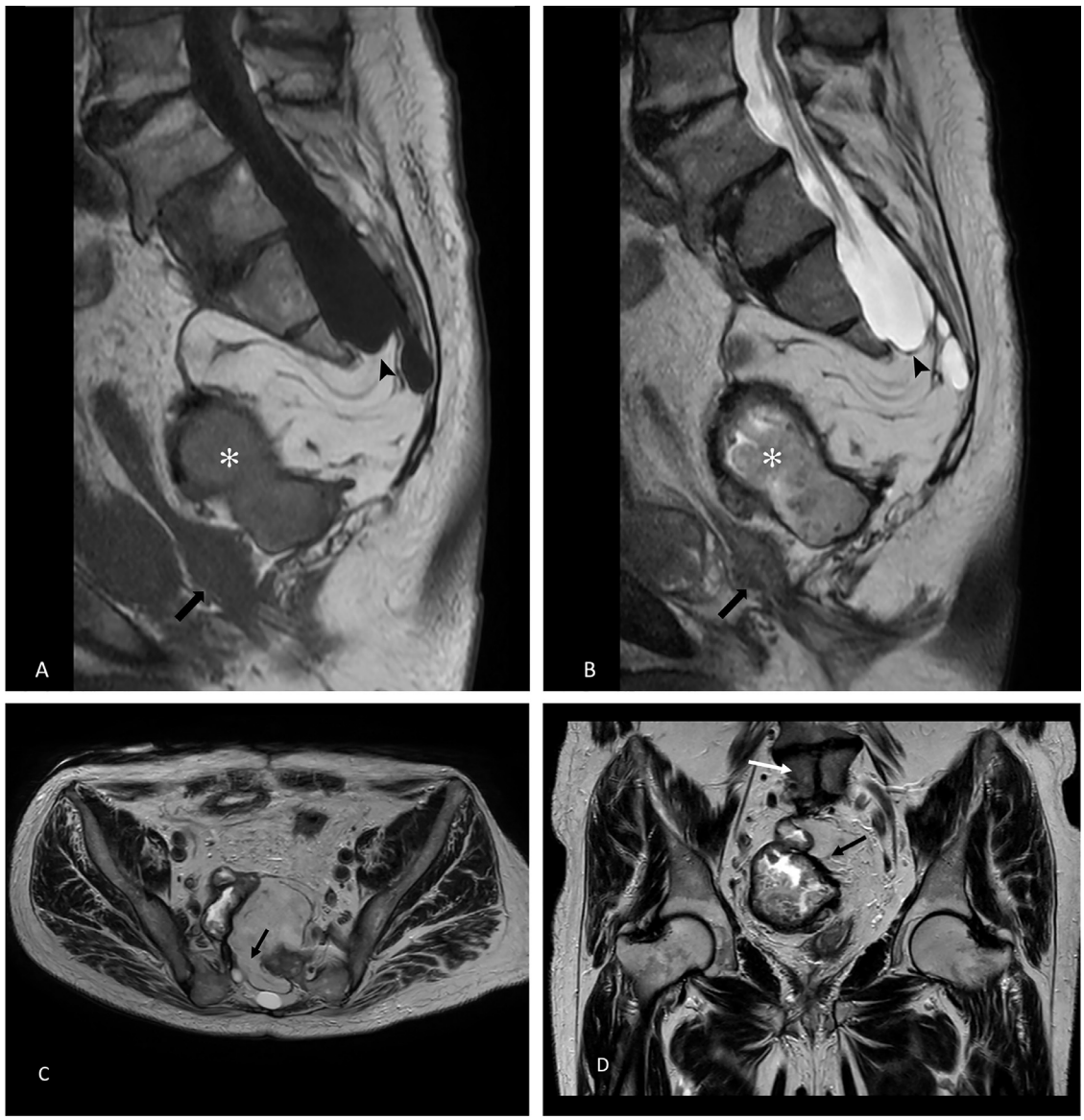

Fig. 1 – Sagittal T1- (A) and T2-weighted images (B) showing a low-lying spinal cord and an anterior sacral lipo-meningocele (black arrowhead) with an adherent mixed cystic and solid lesion (asterisk) located within the pelvis. The presacral mass is in continuity with the fatty tissue of the lipo-meningocele protruding through a cleft located in the anterior and right part of the sacrum and is in near contiguity with the rectum (black arrow). Axial T2-weighted image (C) shows a right sacral cleft (black arrow) with the protruding anterior lipo-meningocele adherent to the presacral mass. Coronal T2-weighted image (D) demonstrated a dysraphism of L5 (white arrow) and confirms the mixed solid and cystic pelvic lesion (black arrow).

caudal development and is required for pancreatic development and spinal cord motor neuron differentiation [7,9,10].

Case report

A 72-year-old man with a recent hemorrhagic stroke was admitted to our Neuroradiology Department to perform a brain follow-up magnetic resonance imaging (MRI) together with a lumbosacral MRI because of a pharmacological-resistant low-back pain. Past medical history included a megacolon surgically treated in early childhood, presumably secondary to Hirschsprung disease. Both MRI studies were conducted on a 1.5 T scanner (Philips Ingenia, Philips Healthcare, Best, The Netherlands).

Brain MRI showed a wide fronto-parietal-insular malacic area, at the previous hemorrhagic lesion location, while the lumbosacral spine study revealed the presence of an unexpected complex spinal malformation and presacral mass.

MRI findings consisted of a low-lying spinal cord, a lipo-meningocele coming through a sacral cleft in the presacral space and an adherent solid-cystic pelvic mass (Fig. 1). To

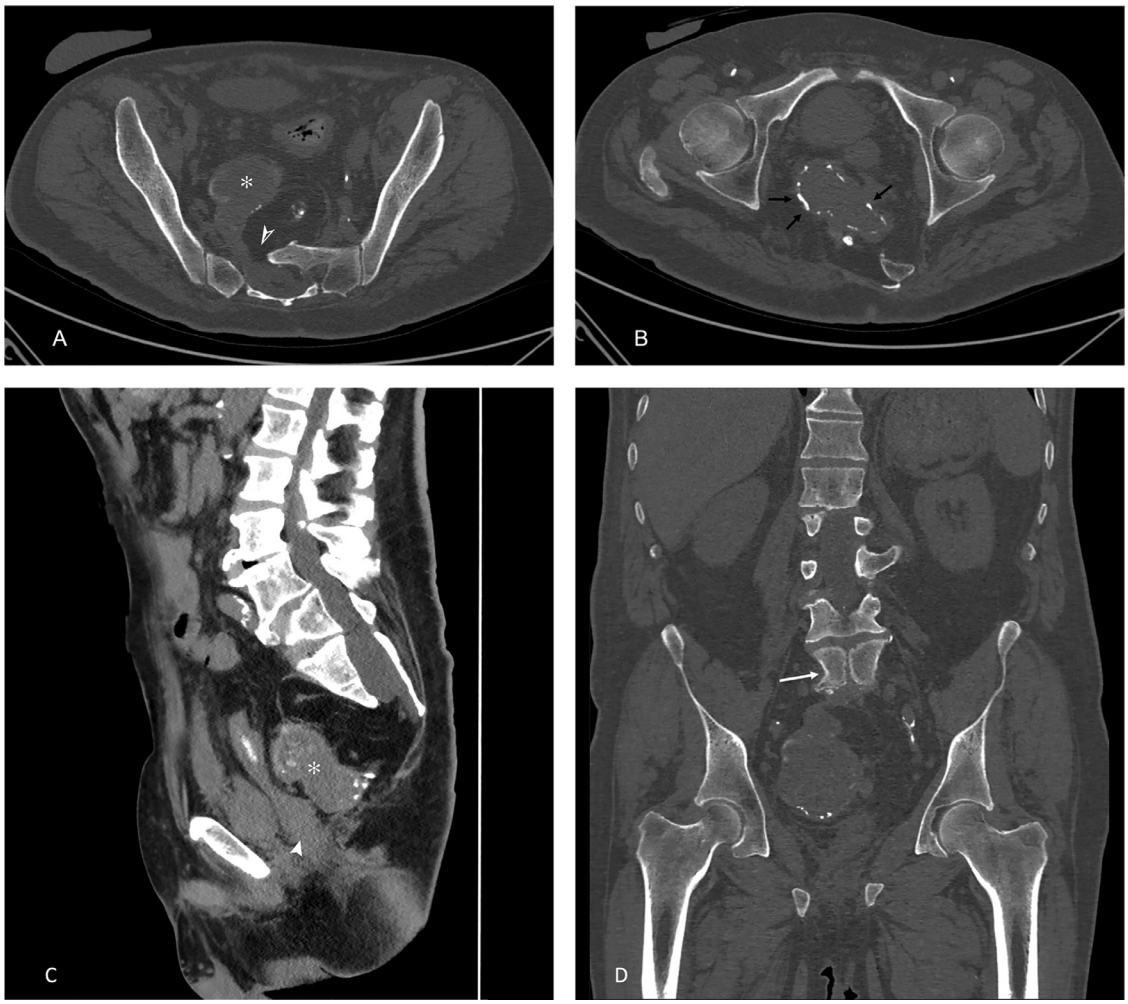

Fig. 2 – Noncontrast-enhanced bone window axial CT section (A) showing the heterogeneous pelvic mass (asterisk) in continuity with the spinal canal through a cleft (white arrowhead) located in the anterior and right part of the sacrum. A caudal CT section (B) depicts several small calcifications (black arrows) in the mass. Sagittal reformat (C) shows the close contiguity between the lipo-meningocele, the heterogeneous pelvic mass (asterisk) and the rectum (white arrowhead). In coronal CT reformat (D), L5 dysraphism is noted.

better assess the bony defects the patient underwent a computed tomography (CT) scan which documented an asymmetric sacral deformity with "scimitar shape" (sacral malformation Type IV according to the classifications of Kalitzk et al [4]), a somatic vertebral cleft at L5 and, only partially evident, at L4 (Fig. 2).

A subsequent research in our digital archive found an abdominal X-ray the patient underwent few years before because of abdominal pain. The radiographic report only described the absence of any air-fluid levels or free subdiaphragmatic air but, at a second look, the scimitar shape sacrum and some punctate pelvic calcification related to the presence of the presacral mass were clearly visible (Fig. 3). Due to these findings the patient was diagnosed with CS.

Because of the possible malignant degeneration of the pelvic mass, the patient was referred for surgical evaluation but he declined any kind of treatment and biopsy. Given the autosomal dominant trait of CS, the patient and his relatives were addressed to perform a genetic counseling.

Discussion

CS is a complex disorder included in the spectrum of caudal regression syndromes. During embryogenesis, the conus medullaris, the filum terminale, and the lower lumbar and sacral nerve roots origin from the caudal cell mass, a group of undifferentiated and pluripotential cells generated by the fusion of the neural epithelium with the notochord and located at the caudal end of embryo.

Table 1 – Reported cases of Currarino syndrome and Hirschsprung disease.

	Authors	Year of publication	Total number of patients	Patient #	M/F	Age at diagnosis	Currarino Triad	Histological examination for HD	Notes	Reference
1	Ohno et al	2013	2	1	F	28 years	Complete	Short-segment aganglionosis	Bicornuate uterus, bilateral ovarian dermoid cysts, and small rectal duplication	[9]
				2	F	17 days			Atrial septal defect, polyp in the right nasal cavity, right vesicoureteral reflux	
2	Baltogiannis et al	2003	1	1	F	6 years	Complete	Aganglionic rectum and the distal sigmoid		[10]
3	Mavridis et al	2005	1	1	F	6 years	Complete	Aganglionic rectum	Post-operative spinal fluid leakage after removing presacral mass	[11]
4	Furuta et al	2015	1	1	M	10 month	Complete	Aganglionic rectum		[8]
5	Martucciello et al	2004	3	1	F	7 years	Complete	Distal aganglionic tract.	Hydromyelia, vesico-ureteric reflux	[4]
				2	F	3 years	Complete	Distal aganglionic tract.		
				3	F	1 year	Complete	Not classificabile dysganglionosis	Vesico-ureteric reflux	
6	Garcia-Barceló et al	2009	1	1	M	2 days	Complete	Aganglionic rectum	Stenotic anus, neurogenic bladder, vesico-ureteric reflux	[7]
7	Isik et al	2010	2	1	F	4 years	Complete	Aganglionic rectum	Narrow ventrally displaced anus, perianal fistulae	[12]
				2	M	5 years	Complete	Aganglionic rectum	Ventrally located anus	
8	Saberi et al	2009	1	1	F	18 years	Complete	HD suspected, not performed		[13]
9	Kilickesmez et al	2006		1	F	11 years	Complete	Aganglionic rectum		[14]

HD, Hirschsprung disease.

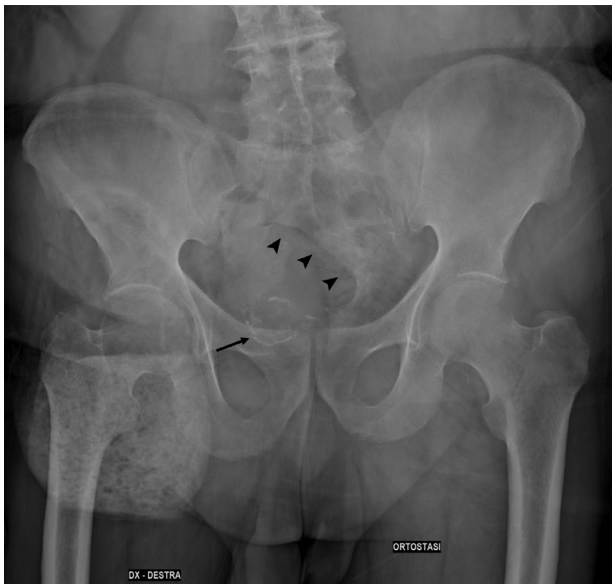

Fig. 3 – Abdominal AP X-ray shows the scimitar shape of the sacrum (multiple black arrowheads) and some punctate pelvic calcifications (black arrow) related to the presence of the presacral mass.

At 30 days, during a process called secondary neurulation, multiple cysts appear in the caudal cell mass and merge to form an ependymal-lined tubular structure that fuses to the neural tube above. At 38 days, the central mass and the central lumen decrease in size through cellular apoptosis and necrosis in a process called retrogressive differentiation. Defects in the process of secondary neurulation and retrogressive differentiation can lead to caudal spinal malformation. Furthermore, given the anatomic proximity of the caudal cell mass to the cloaca, the region of origin of the lower genitourinary tract and anorectal structures, patients with spinal malformation have a high incidence of anorectal and urogenital anomalies and vice versa. [11]

The role of MNX1/HLAX9 gene in the pathogenesis of CS is not completely clear. Additionally, the phenotype variability indicates that the features and severity of the disease might not only depend on MNX1 mutations but also on the effect of other yet unknown genes that could act as modifiers affecting the MNX1 mutation penetrance [7].

Martucciello et al [4] classified CS into 3 phenotypes:

- Complete CS: CS with full expressivity presenting with the hemisacrum, anorectal malformation, and presacral mass;
- Mild CS: hemisacrum and one of the two anomalies, either anorectal malformation or presacral mass;
- Minimal CS: hemisacrum only.

According to our knowledge, this is the eldest patient diagnosed with CS.

Delayed diagnosis in this case is likely due to the absence of the most common symptom, chronic constipation, as the patient had an ileostomy in childhood. Furthermore, CS can present with a wide spectrum of symptoms (constipation, urinary incontinence, sacral anesthesia, paresthesia of the lower extremities, disturbance of anal sphincter control) or even be asymptomatic in a large cohort of patients.

Since our patient had a history of surgically treated megacolon referred to Hirschsprung Disease (HD), we analyzed the literature searching for "Currarino Syndrome and Hirschsprung Disease" and found 13 cases (11 histologically confirmed; 77% females) of reported association between HD and CS (Table 1) [3,7,12–18]. Some authors [4] speculates that embryogenetic relationships between sacral dysgenesis and rectal innervation defects could occur and consequently dysganglionosis should be considered a feature of CS.

Genito-urinary malformations, often noticeable in CS, were not present in our patient. CS urologic involvement may be characterized by duplex ureter, vesicoureteric reflux, double bladder malformed and/or dysplastic kidney, or hypospadias [19,20]. CS is more frequently reported in females and is usually associated with gynecologic abnormalities that can, in some cases, lead to fertility defects. Malformations of the female reproductive system include bicornuate uterus, ovaries absence, septate vagina and bifid clitoridis [19].

Regarding lumbo-sacro-coccygeal osseous defects, a variable degree of sacro-coccygeal dygenesis is always present and the most typical finding, the "scimitar sacrum," also known as sickle-shaped sacrum or hemisacral agenesis, consists of a unilateral, well-marginated, crescent-shaped defect in the lateral sacrum with intact first sacral vertebra. Somatic vertebral cleft in the lower lumbar vertebrae, which appear sometimes partially fused, as in our case, has also been described.

The presacral masses in CS may be a teratoma, anterior sacral meningocele, dermoid cyst, hamartoma, or enteric duplication cyst, or more than one type of these masses may be present.

In our patient an anterior meningocele adherent to a lipomatous tissue and a coarse inhomogeneous mass with contextual calcifications, highly suspicious for teratoma, has been identified. Malignant transformation of the pelvic masses in CS has been described but is infrequent (about 1% of cases). Neuroendocrine tumor and/or adenocarcinoma arising within presacral teratoma have also been reported [1].

Complications in untreated CS include recto-perineal fistulas, pelvic abscesses, dystocia, and meningitis. Therefore, early identification and treatment of this condition is important.

Since CS is mostly a familial condition, the "sporadic" patients with inherited MNX1 mutations are likely to be descendants of asymptomatic individuals (about 33% of cases [21]) in whom signs of the condition can only be detected by radiologic analysis [7].

Since the presence of a hemisacrum is pathognomonic of the disease, a radiograph of the pelvis of each family member with a positive case of CS should be performed. Parents and relatives with abnormal sacra should be studied for MNX1 gene mutations [4].

CS patients have to be clinically and radiologically studied for associated anomalies.

Conclusion

CS is a rare entity, usually diagnosed at birth or in the prenatal period. Nevertheless, the possibility of its identification in old age as in our case should be taken into account. For this reason, the radiologist should be aware of this entity and take this into consideration for the differential diagnosis.

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