Case Report: Prune perineum syndrome: a rare case with an unfavourable outcome [version 2; referees: 3 approved]

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Abstract
Prune perineum syndrome (PPS) is a rare anomaly, with only two previous case reports, both dying in the perinatal period. We report the first case of PPS that reached childhood.

The patient presented with a hypoplastic genitalia and bilateral cryptorchidism. There was no evidence of an anal orifice. A significant prune-like mass was observed, extending from the perineum to both gluteal regions and to a cephalic mid-line bony prominence, with a 1cm central orifice that discharged urine. MRI confirmed the previous findings and revealed a right crossed ectopic kidney, intestinal malrotation, a hypoplastic infrarenal inferior vena cava and a hypoplastic right iliac artery. Endoscopic evaluation through the orifice revealed a cavity lined by urothelial mucosa, with a small communication to the anterior urethra in its anterior wall.

A staged reconstruction was planned, with a first-step urinary diversion through a continent abdominal reservoir associated to bilateral orchiopexy. He was discharged from the hospital three weeks later under intermittent catheterization. The next surgical step would be the resection of the perineal mass and its cavity associated to the removal of the prominent sacrococcygeal bones. Unfortunately, four months after the first surgery the patient developed an acute abdomen and was submitted to a laparotomy that revealed a necrotic ileal segment secondary to obstructive adherences. He developed severe malabsorption followed by septic shock, dying five weeks after the procedure.

Due to the lack of literature, there is no consensus for the management of these cases. The wish of the family for a better quality of life and social acceptance, compelled us to perform a urinary diversion, to be followed by a plastic and orthopedic reconstruction. Despite the successful initial result, the patient developed a late abdominal obstruction that was misdiagnosed, precipitating his untimely death five months after the first procedure.

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Competing interests: No competing interests were disclosed.

Introduction
Prune perineum was first described in 1979 by Peeden et al.\(^1\) and to our knowledge only one further case has been presented\(^2\). PPS includes significant abnormalities in the development of the caudal axis, with characteristic deformation of the sacrococcygeal spine associated with a large wrinkled perineal mass and a hypoplastic external genitalia. In both previously described cases, the patient died in the perinatal period\(^1,2\). We present the first case of a male born with this disease who reached 5 years of age.

Case report
The patient was born at the 39\(^{th}\) week of the uneventful first gestation of a 28-year-old woman, without any family history of congenital malformation or chronic illness. The maternal medical history was uneventful and pregnancy was normal until the last trimester, when control ultrasonography disclosed a fetal perineal abnormality, therefore a cesarean delivery was performed. A large perineal mass, associated to imperforated anus was readily identified. Urine was observed leaking through an orifice in the perineal mass. A left flank terminal colostomy was performed on the second day of life. Post-operatively, the patient presented with good clinical course, with functioning colostomy and preserved renal function, being discharged after 2 weeks. At four years of age, he came to our service without any previous significant clinical problems, including urinary tract infection. The somatic growth and neuro-psycho-motor development were normal. He had no medication, was wearing diapers and a colostomy bag. Despite a small limp, he was able to walk normally.

At physical examination, all abnormalities were below the umbilicus. The abdomen had a functioning left colostomy while the genital area presented hypoplastic male external genitalia with bilateral impalpable cryptorchidism. There was no evidence of an anal orifice. The right leg was shorter than the left (Figure 1). Posteriorly, a 20 × 15 × 8 cm prune-like mass was observed, extending from the perineum to both gluteal regions and to a cephalic mid-line bony prominence, with a 1 cm central orifice that discharged urine. The corrugated skin of the prune-like mass could be easily lifted, disclosing, through its orifice, a large cavity below that contained urine (Figure 2). In the sitting position, the mass and its cavity were compressed against the perineum.

Laboratory examination showed a normal blood count and renal function, and the karyotype was 46, XY. Pelvic radiographs demonstrated an exaggerated sacrococcygeal concavity, lumbar dysrrhaphism and pubic dyastasis. The dorsal bony prominence corresponded to the sacrococcygeal spine, whose abnormal concavity oriented its tip upward, like a small tail. The contrast injection through the orifice of the mass showed a large cavity that extended sagittally and laterally. MRI confirmed the previous...
findings and revealed a right crossed ectopic kidney, intestinal malrotation, a hypoplastic infrarenal inferior vena cava and a hypoplastic right iliac artery. The posterior concavity of saccrococcygeal bones, associated to a deformity of the pelvic rim was evident, as well as the cavity below the convoluted skin and subcutaneous layer of the perineal mass (Figure 3).

The endoscopic evaluation through the perineal orifice communicated to a large perineal cavity lined by urothelial mucosa, resembling a bladder that was abnormally located perineally with a small communication to the anterior urethra in its anterior wall. The orifice was at least 1 cm large, and all urine leaked through this orifice. Nevertheless, on cystoscopic evaluation, a guidewire was inserted through the penile urethra and reached the bladder (the urethra was patent, but very thin). As urine was continuously flowing into the perineal cavity (bladder) and leaking through the perineal cavity, it was evident that the ureter (draining alone the right crossed ectopic kidney) reached the perineal cavity. Nevertheless, on “cystoscopic” evaluation we weren’t able to find the ureteral orifice.

After extensive evaluation of the case and considering the psychological effects of the malformation, as well as the parental wish for a better quality of life and social acceptance of the child, we planned a staged reconstruction, with a first-step urinary diversion through a continent abdominal reservoir associated to bilateral orchiopexy. We created a continent bowel reservoir, but only one ureter was implanted to it, as the patient had only one kidney. A true bladder was not available and therefore, a continent cutaneous ileal neobladder was performed, with the appendix used for clean intermittent catheterization every four hours in the postoperative care. The presumptive primitive bladder, namely the perineal cavity, was left in situ, for posterior removal. It became completely dry after surgery. The procedure was successful and the patient recovered uneventfully. He was discharged from the hospital three weeks later with a dry perineal cavity and under intermittent catheterization regularly performed by the mother. The next surgical step would be the resection of the perineal mass and its cavity associated to the removal of the prominent saccrococcygeal bones. Unfortunately, four months after the first surgery the patient developed an acute abdomen that was misdiagnosed and treated as a urinary tract infection elsewhere. Forty-eight hours later, he was transferred to our service and was submitted to exploratory laparotomy that revealed a necrotic ileal segment secondary to obstructive adherences. The resection of the necrotic segment associated to a terminal ileostomy was performed, but he developed severe malabsorption followed by septic shock, dying five weeks after the procedure.

Discussion
Previously, only two cases of the rare prune perineum syndrome have been described, and both patients died in the perinatal period due to sepsis. Early colostomy and normal renal function by an unobstructed solitary kidney enabled long-term survival in our case. Contrary to the two previous cases, this was a male patient with a 46 XY karyotype, although with a very small penis and impalpable testes. An embryologic explanation for the orifice draining urine was searched and we can only postulate that a fistula eventually ruptured between the “perineal bladder” and skin before birth due to increased intravesical pressure (the perineal wrinkled skin was very thin and had no bony support).

Due to the lack of literature, there is no consensus for the management of these unfortunate children. We report the unsuccessful outcome of a child treated for this syndrome. Even though he presented a quite stable physical development without any neurological impairment up to the age of four years, the wish of the family for a better quality of life and social acceptance, compelled us to perform a urinary diversion, to be followed by a plastic and orthopedic reconstruction. Despite the successful initial result, the patient developed a late abdominal obstruction that was misdiagnosed, precipitating his untimely death five months after the first procedure.

Consent
Written informed consent was obtained from the parent of the patient for publication of this case report and any accompanying images and/or other details that could potentially reveal the patient’s identity.

Author contributions
RIL and GBM retrieved patient data, reviewed the literature and wrote the manuscript. MGM and FTD did a critical revision of the manuscript for scientific and factual content. All authors approved the final version for publication.

Competing interests
No competing interests were disclosed.

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References


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Rodrigo L.P. Romao
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The added details have improved the report significantly.

Again, the authors should be congratulated for reporting the best outcome so far for this very severe congenital malformation.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.

Version 1

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Dana Weiss
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The authors have now provided descriptions of their surgical plan and technique and decision making process. Their report, along with the images they provide, offer a valuable lesson on a way to manage this extremely rare disease.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.
Andrew J. Kirsch
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The authors present a fascinating case of Prune Perineum Syndrome - the first case of survival beyond infancy. Only two others have been reported with PPS over the past half century. The experienced group of pediatric surgeons describe this exceedingly rare condition and offer the child an opportunity to improve quality of life through surgical reconstruction. The preoperative imaging studies are highly educational and instructive. Unfortunately, a delayed postoperative complication and poor access to emergency medical care lead to the patient's demise. This report, however, provides important clinical information to the limited available literature on this condition. This case report will help to educate and guide future generations of patients and their families, as well as physicians and surgeons in the diagnosis and management of PPS.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.

Rodrigo L.P. Romao
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The authors report a case of prune-perineum, an extremely rare malformation for which survival beyond the perinatal period has not been documented. Only 2 previous case reports are described in the literature.

The description of the findings is interesting and the illustrations are of good quality. The description of the surgical technique is short. If the authors were able to provide more details about the reconstruction performed, it would be of interest to the reader. It is not clear what kind of reservoir was created and how exactly CIC was conducted postoperatively. A detailed account of the findings and intra-operative decision-making process would strengthen the report significantly.

The authors should be applauded for reporting the best outcome thus far for this exceedingly rare and complex condition.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Competing Interests: No competing interests were disclosed.
Roberto Iglesias Lopes,

If the authors were able to provide more details about the reconstruction performed, it would be of interest to the reader. It is not clear what kind of reservoir was created and how exactly CIC was conducted postoperatively. A detailed account of the findings and intra-operative decision-making process would strengthen the report significantly.

Answer: A perineal orifice communicated to a cavity, where we identified a bladder, which was abnormally located perineally. The orifice was at least 1 cm large, and all urine leaked through this orifice. Nevertheless, on cystoscopic evaluation, a guidewire was inserted through the urethra and reached the bladder (the urethra was patent, but very thin). A patent, albeit very thin urethra was connected between the perineal cavity (bladder) and the hypoplastic penile shaft. The bladder neck was also very small. As the bladder consisted of a cavity lined with urothelium and was not a true bladder, we opted for a continent bowel reservoir. Only one ureter was implanted to it, as the patient had only one kidney. A true bladder was not available and therefore, a continent cutaneous ileal neobladder was performed, with the appendix used for clean intermittent catheterization every four hours in the postoperative care.

**Competing Interests:** No competing interests were disclosed.

Dana Weiss
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The authors present a very interesting and unique case report.

Some questions that arise:
Had the child had any renal imaging after birth? Was the urine leaking through a penile urethra as well as through the orifice that contained urine? This part is not clear from the description.

The authors could assist the reader additionally, should this case ever arise again, by describing exactly what kind of reconstruction was done at the first stage. Was a true bladder found? Were the ureters implanted normally into a bladder? Was there a bladder neck and urethra? What exactly was the “orifice” that was draining urine? When the authors say they created a continent abdominal reservoir – was this a bowel reservoir to which the ureters were implanted? If there was any bladder present, was this used?

This kind of case report is interesting and important since many pediatric surgeons and urologists may never see something like this in our lifetime, but if we do, it is very valuable to have some inkling of what is going on, and how we might even begin to manage it.
I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

**Competing Interests:** No competing interests were disclosed.

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**Author Response 11 May 2016**

Roberto Iglesias Lopes,

**Author Response to Reviewer’s Comments:**

Had the child had any renal imaging after birth?
Answer: He was referred to us at age 4, having undergone previously a colostomy elsewhere on the second day of life. We started all diagnostic workup from point zero.

Was the urine leaking through a penile urethra as well as through the orifice that contained urine?
Answer: The perineal orifice communicated to a cavity, where we identified a bladder, which was abnormally located perineally. The orifice was at least 1 cm large, and all urine leaked through this orifice. Nevertheless, on cystoscopic evaluation, a guidewire was inserted through the urethra and reached the bladder (the urethra was patent, but very thin).

Was a true bladder found?
Answer: Besides the large perineal cavity (identified as bladder) drained by the orifice and connected to the urethra, there was no other structure resembling a normal bladder.

Were the ureters implanted normally into a bladder?
Answer: As urine was continuously flowing into the perineal cavity (bladder) and leaking through the perineal cavity, it was evident that the ureter (draining alone the right crossed ectopic kidney) reached the perineal cavity. Nevertheless, on "cystoscopic" evaluation we weren't able to find the ureteral orifice.

Was there a bladder neck and urethra?
Answer: As mentioned before, a patent, albeit very thin urethra was connected between the perineal cavity (bladder) and the hypoplastic penile shaft. The bladder neck was also very small.

What exactly was the “orifice” that was draining urine?
Answer: We do not have an embryologic explanation for it, and we can only postulate that a fistula eventually ruptured between the "perineal bladder" and skin before birth due to increased intravesical pressure (the perineal wrinkled skin was very thin and had no bony support).

When the authors say they created a continent abdominal reservoir – was this a bowel reservoir to which the ureters were implanted?
Answer: Exactly: it was a continent bowel reservoir, but only one ureter was implanted to it, as the patient had only one kidney.

If there was any bladder present, was this used?
Answer: The presumptive primitive bladder, namely the perineal cavity, was left in situ, for posterior removal. It became completely dry after surgery.
Competing Interests: None