

Diagnostic Input of Specialized Radiographic Examinations in Pediatric Setting in Ouagadougou (Burkina Faso)

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Abstract

Context: In spite of the development of cross-sectional medical imaging and endoscopy means, the prescription of specialized radiographic examinations is still relevant in the pediatric environment in our country. **Objective:** Show the contribution of specialized radiographic examinations performed in pediatric settings. **Methodology:** This was a retrospective descriptive study implemented over a five year-period, from June 10th, 2014 to June 10th, 2019 within the radiology department of Charles De Gaulle Pediatric Teaching Hospital in Ouagadougou. This study included the results of 192 specialized radiographic examinations collected within the concerned department. **Results:** The average age of the patients was 4.21 years with extremes of 8 days and 15 years. Infants (29 days to 24 months) were the predominant age group with a rate of 53.13% (n = 102 patients). Boys represented 76.51% of the sample with a sex ratio estimated at 3.25. Specialized radiographic examinations represented 0.46% of the overall imaging examinations and 0.72% of radiographic examinations performed during the study period. 67.19% of pathological examinations were reported. Colonic enema and retrograde urethrocytography (RUC) were the most performed examinations respectively accounting for 33.34% and 27.6%. The radiographic findings were consistent with the diagnostic hypotheses in 41.6% of cases. **Conclusion:** Specialized radiographic examinations keep their place in the exploration of several pathologies in pediatric settings.

Keywords

Esophageal Transit, Retrograde Urethrocytography, Hirschsprung's Disease

1. Introduction

Specialized radiographic examinations encompass all radiographic examinations performed after digestive, urinary, intravenous, intracavity or intraductal administration of an iodinated contrast medium. The use of contrast medium in radiology came out of the will to be able to explore certain cavities not visible through standard radiography [1].

Several authors have demonstrated the contribution of these specialized explorations in digestive or urological pathology [2] [3] [4] [5].

However, their indications have been progressively reduced since the advent of other medical imaging methods such as ultrasound, scanner and MRI [6]. Endoscopic methods have also shown real interest in the exploration of the digestive tract in children [7] [8] [9].

In Burkina Faso, specialized radiographic explorations are often prescribed in daily practice as a complementary assessment for certain conditions. Indeed, pediatric endoscopic methods are not yet available.

The availability and accessibility of magnetic resonance imaging and computerized tomography are still limited.

In the literature, we did not note any studies conducted in Burkina Faso on specialized radiographic examinations in the pediatric setting.

In an era when cross-sectional imaging techniques such as non-irradiating ones, and endoscopic explorations are increasingly used, we have set ourselves the objective of showing the indications and the diagnostic input of specialized radiographic examinations performed within pediatric setting.

2. Material and Methods

This was a cross-sectional descriptive and analytical study conducted over a five-year period from June 10th, 2014, to June 10th, 2019. This study took place in the radiodiagnostic and medical imaging department of the Charles de Gaulle Pediatric Teaching Hospital in Ouagadougou.

It included all patients aged 0 to 14 years who received specialized radiographic exploration during the study period. Specialized radiology generally requires the absorption, introduction or injection of contrast agents depending on the type of examination requested. The radiography table used was an Axiom Luminos (Siemens) established in 2014. Reports not found were excluded.

The information was collected from the examination report register. The collection of examination reports was done consecutively during the study period.

The variables explored were administrative data (year the examination was performed, medical structure of origin, qualification of the prescriber) and ad-

ministrative data (age, sex, type of examination, indication, results). The examination was deemed relevant if, for the indication mentioned, the requested examination was the one indicated in the guide about the proper use of medical imaging examinations presented by the French Society of Radiology in 2012. This guide deals with recommendations for all medical imaging modalities regarding several clinical situations.

Information was collected anonymously, guaranteeing confidentiality. The data collected were analyzed through Epi Info 7.1.5.0 software.

3. Results

We collected 235 specialized radiographic examinations out of a total of 32, 648 imaging examinations performed during the study period. The proportion of specialized radiographic examinations represented 0.46% of the overall examinations performed and 0.72% of radiographic examinations. For our study, 192 explorations with an exploitable report were included.

Infants (29 days to 24 months) were the most represented age group with a prevalence of 53.13% ($n = 102$). The examinations involved 76.51% of male patients, corresponding to a sex ratio of 3.25.

The indications for specialized radiographic examinations are listed in **Table 1**.

An annual average of 38.4 specialized radiographs was reported. Patients from the Charles de Gaulle Pediatric Teaching Hospital accounted for 51.96% of the cases against 62.96% of specialist physicians requesting them.

The specialized radiographic examinations performed were dominated by colonic enema with barium or with water-soluble in 33.34% of cases ($n = 64$) and retrograde urethrocytography (RUC) in 27.6% ($n = 53$).

Table 2 indicates the proportion of specialized radiographic examinations performed.

The results of these specialized examinations were pathological in 67.19% of cases. The most frequent abnormalities were:

- on RUC, posterior urethral valves in 51.35% of cases (**Figure 1**) and urethral stenosis in 16.22%.
- on ET, esophageal caustic stenosis in 76.92% of cases (**Figure 2**), esophageal fistulas in 7.7% of cases.
- on enema, dolichocolon in 53.57% of cases and Hirschsprung's disease in 42.86% of cases (**Figure 3**).
- on distal colostogram, recto-ureteral fistula in 46.67% (**Figure 4**) of cases and recto-vaginal fistula in 40%.
- on IVU, two cases of junction syndromes and one mute kidney.

The indications for specialized radiographic examinations were relevant in 53.65% of cases. Indications for distal colostogram were relevant in 100% of cases. No indication for IVU was relevant: this examination could be replaced by ultrasound, uro-CT or uro-MRI.

Table 1. Indications of specialized radiographic examinations.

Examinations	Indications	Frequencies	%
CYSTOGRAPHY/ RUC/INTRA VENOUS UROGRAPHY N = 58	Suspicion of posterior urethral valves	22	11.46
	Pelvic trauma	6	3.13
	Assessment of dysuria	6	3.13
	Ureterohydronephrosis	6	3.13
	Post-operative check-up	7	2.08
	Seeking vesico-ureteral reflux	3	1.56
	Urethral stenosis	3	1.56
	Prune belly syndrome	2	1.04
	Junction syndrome	2	1.04
	Recurrent urinary tract infection	1	0.52
ESOGASTRIC TRANSIT N = 47	Esophageal caustic stenosis	21	10.94
	Chronic vomiting	8	4.17
	Aero-esophageal fistula	3	1.56
	Esophageal fistula	3	1.56
	Esophageal stenosis	2	1.04
	Caustic pyloric stenosis	1	0.52
	Purulent pleurisy	1	0.52
	Postoperative check-up	2	1.04
Seeking digestive malformation	6	3.13	
COLONIC ENEMA N = 64	Suspicion of Hirschprung's disease	46	23.96
	Chronic constipation	11	5.73
	Postoperative check-up	2	1.04
	Parieto-colic fistula	2	1.04
	Cicatricial stenosis of the neo anus	3	1.56
DISTAL COLOSTOGRAM N = 23	Assessment of anorectal malformation	22	11.46
	Assessment of latero-vesical mass	1	0.52

Table 2. Proportion of special radiographic examinations performed.

Type of examination	Frequency	Percentage (%)
colonic enema	64	33.34
Cystography/RUC	53	27.6
Eso-gastro-duodenal transit	47	24.48
Distal colostogram	23	11.98
IVU	5	2.6
TOTAL	192	100

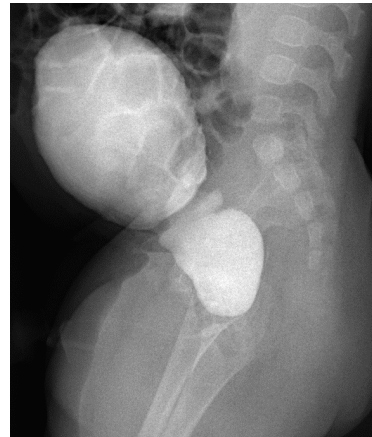


Figure 1. Retrograde urethrocytography with a profile view in a 4-year-old child, showing bladder distension with a subvesical chamber appearance suggestive of posterior urethral valves.

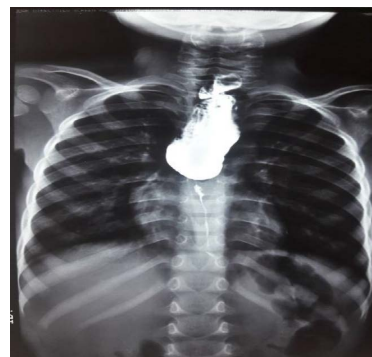


Figure 2. Tight esophageal stenosis on a frontal Eso-gastro-duodenal transit.



Figure 3. Appearance of Hirschsprung's disease on barium enema showing distension of the recto-sigmoid hinge with an absence of colonic haustrations. There is a clear disparity in caliber with the rest of the colon upstream.



Figure 4. Distal colostogram. Opacification of the distal colon showing opacification of the bladder and urethra in per miction.

58.33% of cases had a general good radio-clinical concordance. Distal colostogram, RUC and contrast enema had the highest rates respectively with 69.57%, 67.92% and 54.84%.

4. Discussion

Specialized radiographic examinations are complementary to standard radiography, providing luminal, vascular, cavity or parenchymal opacification.

In our series, the rate of specialized radiographic examinations was relatively low compared to that of other authors. Our results are notably lower than those of Adjénou *et al.* [10] who reported a rate of 3.34% of specialized radiological examinations in their general radiological activity.

In our context, the availability of radiographic examinations is often limited because of recurrent breakdowns of radiology equipment. Besides, the access to these examinations can be reduced through the cost of consumables, especially that of contrast medium, which is covered by the families, even if the examination cost is totally subsidized by free health care policy of children aged 0 to 5 years.

Infants were the most frequent age group in our sample. Indeed, this is the period when certain abnormalities, such as posterior urethral valves, are identified. Our sample was dominated by males; this could be explained by the fact that, on the one hand, posterior urethral valves exclusively affect boys and, on the other hand, Hirschsprung's disease much affects boys based on literature data [6].

Colonic enema, retrograde urethrocytography and TO were the most frequently performed special examinations.

Several authors of the literature had shown the contribution of these explorations in daily practice. Houssaini *et al.* in Morocco [4] had highlighted that colonic enema with contrast medium was the most common used colonic imaging method in developing countries. This exploration allows to opacify the rectum

and the whole colonic framework. However, it enables to highlight certain etiologies of incomplete occlusions such as the microcolon in neonatal period. In our series, this examination was most often prescribed in front of chronic constipation, as mentioned by several authors [11] [12]. It also enabled to suspect a Hirschsprung's disease or to demonstrate a dolichocolon in most cases. It is also indicated in the assessment of anorectal malformations. Its use is currently reserved to endoscopic failures such as technical insufficiencies or impassable strictures [13]. The diagnosis of certainty of Hirschsprung's disease is based on histopathology through rectal biopsies [14] [15].

However, for the exploration of certain pathologies, such as the mucosa, the enema has been replaced by colonoscopy, which also allows to simultaneously perform biopsies.

The distal colostogram is the opacification of a distal segment of a colostomy with a contrast medium before colonic reduction. It is often prescribed as part of the preoperative assessment for the restoration of digestive continuity. It allows to opacify the downstream segment of the stoma and to verify the absence of fistula. All the indications for this examination were relevant because despite the existence of other imaging methods, this exploration remains unavoidable when exploring the continuity of the digestive tract and in the search for a fistulous path.

Retrograde urethrocytography and intravenous urography were the main special urological examinations prescribed in children. RUC allowed to conduct a morphological and mictional study of the lower urinary tract by retrograde approach with an iodinated contrast medium. It currently tends to be replaced by endoscopic methods (cystoscopy and echocystoscopy), thus allowing therapeutic procedures to be combined with diagnosis. The indications mainly included vesico ureteral reflux or suspicion of posterior urethral valves, with dysuria as the primary symptom.

For Kalhoul *et al.* [5] in Morocco, RUC was prescribed in 73% of malformative uropathies in children with a diagnostic input of 100%. Alouky *et al.* [16] noted a preponderance of pyeloureteral junction syndrome in 32% of cases and vesico ureteral reflux in 20.2%.

IVU was formerly considered as the reference radiological examination of the urinary tract. However, its indications have been greatly reduced since the use of ultrasound, uroscanner and uro-MRI. In our study, this examination was very rarely performed.

The relevance of IVU and RUC indications was less good in our study because of the existence of other imaging means such as ultrasound, computed tomography or endoscopic methods, which could have led to the suspected diagnosis.

Eso-gastro-duodenal transit allows the opacification of the upper part of the digestive tract (from the esophagus to the duodenum) with contrast medium. It is no longer indicated in the search for gastroesophageal reflux and has been replaced by Phmetry [17]. The assessment of esophagitis and hypertrophic pyloric stenosis is currently done through endoscopy and ultrasound.

However, Eso-gastro-duodenal transit enables to have an overview of the esophagus including its topography and motility. It is mainly used preoperatively to seek anatomical factors giving way to gastroesophageal reflux (cardio tuberosity malposition or hiatal hernia) or in case of esophageal stenosis. Even if endoscopic methods have increasingly gained momentum in the exploration of esophageal pathologies, they can be taken in default in the case of very tight stenosis or in case of a perforation risk. It was most often prescribed in the exploration of caustic esophageal strictures in our study, as in Tadmori *et al.* [2] in Morocco.

Esophageal transit is usually prescribed as a second-line procedure two to three weeks after ingestion of the caustic product, to seek stenosis lesions. The initial exploration should be performed by endoscopy, which highlights the extent of esophageal and gastric lesions [18].

The relevance rate of the examinations and of radio-clinical concordance was generally high, which can be explained by the fact that special examinations are usually prescribed by specialist physicians, most often in the context of pre-operative check-ups, therefore justifying a better diagnostic and etiological approach to their patients. These results were also observed by Adjénou *et al.* [10] who reported a rate of 64.6%.

Our works are limited because of the monocentric component of the study on the one hand and because of the low proportion of special radiographic examinations performed during the study.

5. Conclusion

Despite the development of non-irradiating imaging examinations, certain specialized radiographic techniques still have their place in the exploration of certain pathologies, particularly in pediatric setting.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Schmutz, G., *et al.* (1996) Radiologie contrastée du tube digestif Barium studies of the gastro-intestinal tract. *EMC-Chirurgie*, **1**, 533-551. <https://doi.org/10.1016/j.emcchi.2004.05.003>
- [2] Tadmori, I., Idrissi, M.L. and Hida, M. (2015) Difficultés de prise en charge de la sténose caustique \varnothing esophagienne chez l'enfant (série de 10 cas). *Journal de Pédiatrie et de Puériculture*, **28**, 177-184. <https://doi.org/10.1016/j.jpp.2015.05.005>
- [3] Ayite, A., Dosseh, E., Etey, K., Senah, K., Napokoura, K. and James, K. (1996) Les cancers de l'intestin grêle au CHU de Lomé (Togo). A propos de 8 cas observés en 10 ans. *Médecine D'Afrique Noire*, **43**, 533-537.
- [4] Houssaini, A.S., Nassar, I., Bakkacha, O., Bouklata, S., Hammani, L., Ajana, A., *et al.* (2009) Le lavement baryté du normal au pathologique: Première partie. *Feuillets de Radiologie*, **49**, 345-349. [https://doi.org/10.1016/S0181-9801\(09\)73198-7](https://doi.org/10.1016/S0181-9801(09)73198-7)

- [5] Kahloul, N., Charfeddine, L., Fatnassi, R. and Amri, F. (2010) Les uropathies malformatives chez l'enfant: à propos de 71 cas. *Journal de Pédiatrie et de Puériculture*, **23**, 131-137. <https://doi.org/10.1016/j.jpp.2009.10.004>
- [6] Buffet, C. Cancer du pancréas exocrine: clinique, bilan diagnostique et préthérapeutique. EMC, Elsevier Masson SAS, Paris, Hépatologie.
- [7] Mougnot, J.-F., Faure, C. and Olives, J.-P. (2002) Fiches de recommandations du Groupe francophone d'hépatologie, gastroentérologie et nutrition pédiatrique (GF-HGNP). Indications actuelles de l'endoscopie digestive pédiatrique. *Archives de Pédiatrie*, **9**, 942-944. [https://doi.org/10.1016/S0929-693X\(02\)00041-6](https://doi.org/10.1016/S0929-693X(02)00041-6)
- [8] Marchat, F., Moulinier, B., De Prado, R. and Lambert, R. (1975) L'oesophago-gastro-duodénoscopie en pédiatrie. *Acta Endoscopica*, **5**, Article No. 15. <https://doi.org/10.1007/BF03025237>
- [9] Dupont-Lucas, C., Bellaïche, M., Mouterde, O., Bernard, O., Besnard, M., Campeotto, F., et al. (2010) Quelles indications pour l'endoscopie du gre'le par videocapsule en pediatrie? *Archives de Pédiatrie*, **17**, 1264-1272. <https://doi.org/10.1016/j.arcped.2010.04.026>
- [10] Adjenou, K., Sonhaye, L., Agoda-Koussema, L., Tchaou, M., N'timon, B.A., Anoukoum, T., et al. (2006) Profil des examens radiographiques speciaux conventionnels dans les services de radiologie du Chu de Lome: A propos de 249 cas. *Journal de la Recherche Scientifique de l'Université de Lomé*, **8**.
- [11] Szmigielski, W., Venkatraman, B., Ejeckam, G.C. and Jarikre, L.N. (1998) Abdominal tuberculosis in Qatar: A clinico-radiological study. *The International Journal of Tuberculosis and Lung Disease*, **2**, 563-568.
- [12] Attias, S., Grellet, J. and Bellin, M.F. (1991) Le lavement baryté double contraste: Technique et interprétation. *Feuillets de Radiologie*, **31**, 197-203.
- [13] Boudiaf, M., Soyer, P. and Rymer, R. (2004) Examens morphologiques au cours des MICI. 2004. [https://doi.org/10.1016/S0399-8320\(04\)94987-1](https://doi.org/10.1016/S0399-8320(04)94987-1)
- [14] Quénéhervé, L., Neunlist, M., des Varannes, S.B., Tearney, G. and Coron, E. (2015) Nouvelles stratégies d'analyse endoscopique des maladies digestives. *Médecine Sciences*, **31**, 777-783. <https://doi.org/10.1051/medsci/20153108017>
- [15] Bastard, F. and Podevin, G. (2015) Maladie de Hirschsprung, diagnostic et prise en charge actuelle. *Côlon & Rectum*, **9**, 149-154. <https://doi.org/10.1007/s11725-015-0593-3>
- [16] Alouky, F. and Jalal, H. (2015) Les uropathies malformatives: Quel intérêt pour l'imagerie? Expérience du CHU Mohammed VI.
- [17] Gottrand, P.F. (2007) Reflux gastro-œsophagien. *La revue du praticien*, **57**, 95.
- [18] Larrosa-Haro, A., Sánchez-Ramírez, C.A., Mesa-Magaña, J.M. and Vasquez-Garibay, E.M. (2017) Caustic Ingestion in Children. *Esophageal Abnormalities*, **47**, 151. <https://doi.org/10.5772/intechopen.68604>