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Morphopathological Findings In Negative Appendectomies In Children

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Abstract:
Background: *The removal of a macroscopically and/or histologically normal appendix during surgical interventions performed on the basis of a clinical suspicion of acute appendicitis is referred to as negative appendectomy, although there is no consensus regarding this definition.*
The aim of the study was to evaluate the rate of negative laparoscopic appendectomy in children with a clinical suspicion of acute appendicitis and to analyze the correlation between intraoperative macroscopic features and the histopathological findings of the appendiceal specimens.
Materials and Methods: *A retrospective study was conducted on 650 patients aged 3–18 years who underwent open appendectomy and 250 children who underwent emergency laparoscopic appendectomy between 2018 and 2025. Negative appendectomy was defined as the absence of postoperative histopathological evidence of acute appendicitis, which was defined as the presence of transmural acute inflammation of the appendix.*
Results: *Initially, 84 patients were classified as having undergone a negative open appendectomy, yielding a rate of 12.92%. Of the total number of patients with negative open appendectomy, 21 cases showed no evident histopathological inflammatory changes in the appendix on histological examination; in these cases, alternative diagnoses were identified, such as ovarian apoplexy (4 cases), endometriosis (1 case), polycystic ovary syndrome (1 case), intraluminal parasites (6 cases), and regional mesadenitis without signs of pelvioperitonitis (9 cases). In 63 patients, various histological changes were documented in the removed appendix, including submucosal lymphoid follicular hyperplasia without significant signs of mucosal inflammation and without involvement of the muscular layers (37 cases), chronic appendicitis (10 cases), ganglioneuropathies (5 cases), intraluminal coproliths (6 cases), parasitic infection associated with submucosal lymphoid follicular hyperplasia (3 cases), well-differentiated carcinoid tumor (1 case), and malignant non-Hodgkin lymphoma (1 case).*
Of the total 250 laparoscopic appendectomies, the negative appendectomy rate was 17 cases (6.8%). Histological examination revealed chronic appendicitis with obliteration of the appendiceal lumen and subatrophic hyperplastic or atrophic changes (8 cases), the presence of coproliths (5 cases), lymphoid follicular hyperplasia in 2 cases, and in 2 cases lymphoid follicular hyperplasia associated with the intraluminal presence of helminths.
Conclusions: *Laparoscopic appendectomy represents a feasible option for reducing the incidence of negative appendectomy in children. The term "negative appendectomy" should be redefined in pediatric surgery based on the implementation of new strategies aimed at improving diagnostic accuracy, including videolaparoscopy, which - together with a high index of suspicion for certain misleading diagnoses - may contribute to reducing the risk of unnecessary surgical interventions and avoiding negative appendectomy in children. Histopathological examination of appendiceal resection specimens in children should be considered mandatory and justified even when the appendix appears macroscopically normal, given the potential for identifying unusual histopathological findings in negative appendectomy specimens from children with a clinical suspicion of acute appendicitis.*
Keywords: *Acute appendicitis; children; negative appendectomy; incidence; pediatric surgery; pathology.*

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I. Introduction

Although acute appendicitis is one of the most common conditions requiring emergency surgical intervention, its diagnosis in children remains quite challenging, both because of the frequently atypical clinical presentation and the presence of symptoms that may mimic other nosological entities, making differential diagnosis particularly difficult. Typical clinical symptoms are present in only about 60% of patients. These factors significantly influence the increased rate of negative appendectomies or contribute to a frequently delayed diagnosis, as confirmed by the high rate of misdiagnosis at initial presentation, ranging from 12% to 57%, especially in young children [1, 2]. In approximately one-third of patients, perforation occurs before surgical intervention and is associated with substantial morbidity, including the development of intra-abdominal abscesses,

small bowel obstruction, sepsis, intestinal resection, prolonged hospitalization, an increased number of medical consultations, and higher healthcare costs [3–6].

The removal of a macroscopically and/or histologically normal-appearing appendix during open surgical procedures performed on the basis of a clinical suspicion of acute appendicitis is referred to as negative appendectomy, with the aim of preventing future diagnostic confusion [7]. At the same time, the identification of a macroscopically normal appendix during laparoscopy for right iliac fossa pain presents a clinical dilemma, as there is no universally accepted protocol for the management of such cases in children, and the long-term consequences of leaving the appendix in situ remain unclear [8].

Atypical manifestations of appendicitis, false-positive results in diagnostic tests, and variability in symptom presentation are key factors contributing to the occurrence of negative appendectomies [9]. Although several clinical prediction scores with high overall diagnostic accuracy have been developed for children with suspected appendicitis, safely excluding the diagnosis based solely on these tools remains challenging [10, 11]. With the preoperative use of advanced imaging modalities, a significant increase in diagnostic accuracy for acute appendicitis has been observed, and the reported rates of negative appendectomy have substantially decreased [12–14]. Negative appendectomy rates of up to 25% have been considered acceptable in order to avoid the morbidity associated with missed perforated appendicitis, with a higher acceptable rate in children [15]. Nevertheless, the worldwide rate of negative appendectomy varies between 1% and 46%, with most reports indicating an incidence of 10–15%. Approximately 6% of patients who undergo negative appendectomy subsequently develop complications [16, 17].

There is no consensus regarding the definition of negative appendectomy, with some authors considering only a histologically normal appendix without pathology or the “absence of intramural neutrophils” in the appendix [18, 19], a view that is disputed by others [20]. The diagnostic criteria used by pathologists to diagnose appendicitis are variable. Although transmural inflammation of the appendix is the most widely accepted definition, there is an opinion that mucosal inflammation/ulceration should also be included as a sign of early appendicitis [15, 21]. Moreover, some authors note that the macroscopic appearance of acute appendicitis is variable, and the external appearance may not correlate with the histological extent of inflammation [22].

The aim of the study was to evaluate the rate of negative laparoscopic appendectomy in children with a clinical suspicion of acute appendicitis and to analyze the correlation between intraoperative macroscopic characteristics and the histopathological findings of appendiceal specimens.

II. Materials And Methods

This study was conducted based on a retrospective analysis of cases in which a macroscopically normal appendix was identified during open or laparoscopic appendectomy performed for right iliac fossa pain, with evaluation of the spectrum of morphopathological changes identified in the appendectomy specimens. The study included data from 650 patients who underwent primary open appendectomy and 250 patients who underwent primary laparoscopic appendectomy between 2018 and 2025. Data were collected from the institutional database containing the electronic medical records of all operated patients aged 3–18 years. The intraoperative diagnosis of acute appendicitis established by the surgeon was compared with the histopathological examination results of the resection specimens in all cases. Review of the medical records revealed that all children included in the study group had a preoperative clinical suspicion of acute appendicitis, including right iliac fossa tenderness and rebound tenderness in the lower abdomen, although ultrasonographic findings were inconclusive in cases of catarrhal acute appendicitis.

Histologically, acute appendicitis was defined as the presence of transmural acute inflammation of the appendix, characterized by neutrophils at the base of the crypts, in the submucosa, and possibly within the muscular wall, with or without signs of periappendicitis [23]. Cases of acute (early/catarrhal) appendicitis were considered those presenting early histological criteria, such as neutrophilic infiltration of the appendiceal mucosa with superficial ulceration [22]. The remaining cases, in which the histological findings of the excised appendix revealed no inflammatory component, were interpreted as negative appendectomy.

III. Results And Discussion

Of the 650 children who underwent open appendectomy, 93 cases (14.31%) were diagnosed with histologically confirmed acute catarrhal appendicitis, 415 cases (63.85%) showed various subtypes of phlegmonous appendicitis, and 58 cases (8.92%) were diagnosed with acute gangrenous appendicitis. Initially, 84 patients were classified as having undergone negative appendectomy, yielding a rate of 12.92%. Among the total number of patients with negative appendectomy, 21 cases showed an appendix without evident histopathological inflammatory changes (fig. 1). In all these cases, alternative diagnoses that could explain the abdominal pain were identified, such as ovarian apoplexy (4 cases), endometriosis (1 case), polycystic ovary syndrome (1 case), intraluminal parasites (6 cases), and regional mesadenitis without signs of pelvioperitonitis (9 cases). In the remaining 63 patients, various histological changes were documented in the removed appendix,

including submucosal lymphoid follicular hyperplasia without significant mucosal inflammation and without involvement of the muscular layers (37 cases), chronic appendicitis (10 cases), ganglioneuropathies (5 cases), intraluminal coproliths or fecal masses without evident inflammatory changes (6 cases), parasitic infection (*Enterobius vermicularis*) associated with submucosal lymphoid follicular hyperplasia (3 cases), well-differentiated carcinoid tumor (1 case), and malignant non-Hodgkin lymphoma (1 case).

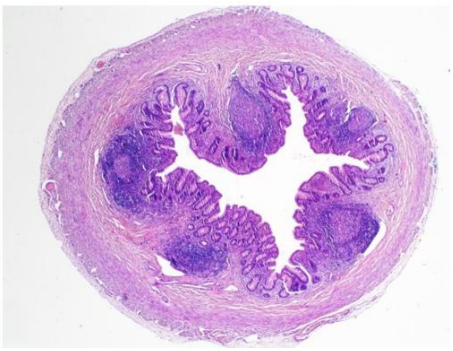

Fig. 1. Histological appearance of the removed appendix in a 5-year-old child without evident inflammatory changes: The appendiceal lumen was slightly stellate and patent. Broad mucosal folds with a mamillated appearance were observed, lined by epithelium with a preserved goblet cell component present both on the folds and within the crypts; the lamina propria was prominent. In the superficial areas, the mucosa showed mild lymphocytic cellularity. Multiple lymphoid follicles were present, highlighted by variably developed germinal centers with preservation of the follicular mantle. The submucosa appeared loosely fibrillar, clearly delineating the submucosal boundary. The muscular layer showed slight, insignificant thickening of the inner layer, without any inflammatory infiltrates. Ganglioneuronal structures were present. The serosa displayed a mildly congested vascular network and discrete lymphocytic cytosis within the serosal lymphatics.

Of the total 250 laparoscopic appendectomies, morphopathological changes characteristic of catarrhal appendicitis were documented in 19 cases (7.6%), histologically presenting mucosal erosions and early inflammatory changes localized to the mucosa and submucosa. It should be noted that the optical magnification provided by videolaparoscopy allowed a more objective assessment of inflammatory signs characteristic of the catarrhal form of acute appendicitis, such as hyperemia (19 cases), punctate hemorrhages localized at the level of the serosa (13 cases), mesoappendiceal edema (7 cases), the presence of fluid in the right iliac fossa (7 cases), including the pelvis (3 cases), and hyperemia of the parietal peritoneum (12 cases), visual signs also described in the literature [24]. Histologically, phlegmonous appendicitis was identified in 182 cases (72.8%), while gangrenous appendicitis was documented in 32 cases (12.8%), including 10 cases with perforation.

The rate of negative appendectomy in this cohort of laparoscopically operated patients was 17 cases (6.8%). No cases of removal of an appendix without histopathological changes were identified. Most frequently, the excised specimens showed morphopathological changes characteristic of chronic appendicitis with obliteration of the appendiceal lumen and subatrophic hyperplastic or atrophic changes (8 cases) (fig. 2), the presence of coproliths (5 cases), and lymphoid follicular hyperplasia in 2 cases (fig. 3A). In 2 cases, lymphoid follicular hyperplasia was associated with the intraluminal presence of helminths (fig. 3B).

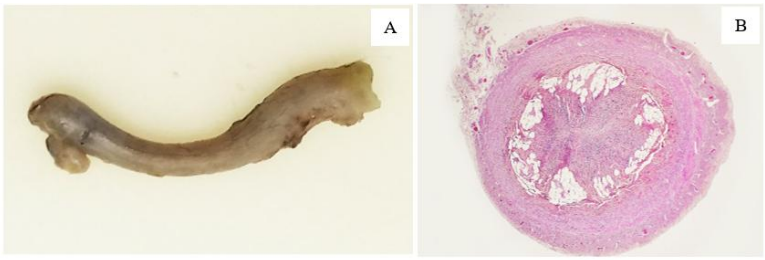

Fig 2. Patient V., 11 years old. A – Macroscopic appearance of the excised vermiform appendix (anatomical-surgical specimen following laparoscopic appendectomy): the serosa appeared pale, smooth, and slightly glossy, with mild vascular injection. B – Histological appearance characteristic of chronic obliterative sclerosing appendicitis: sclerosed mucosa with retractile scarring, submucosal sclerosis, lipomatosis, and segmental persistence of lymphatic vessels containing a lymphocytic component within the lumen; the muscular layers were focally mildly atrophic.

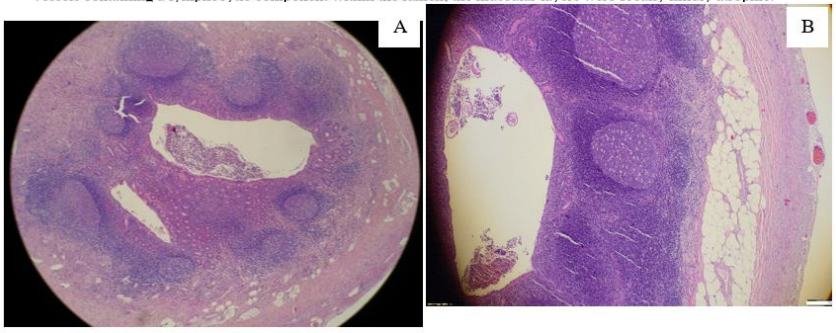

Fig. 3. Histological appearance of appendiceal lymphoid hyperplasia, characterized by prominent lymphoid follicles associated with an intraluminal mucosal septum (A) and helminths (B), without inflammatory changes in the appendiceal wall.

The obtained results confirm that laparoscopic appendectomy has a statistically significantly lower rate of negative appendectomies compared with the cohort of patients who underwent open surgery ($p < 0.01$). Videolaparoscopy allowed not only an adequate diagnosis of acute appendicitis but also raised suspicion of changes characteristic of chronic appendicitis in symptomatic cases presenting with longer-duration right lower quadrant abdominal pain, recurrent episodes, and relatively low-intensity pain; the diagnosis was subsequently confirmed histologically. Regarding the annual distribution of negative appendectomies, no significant differences were observed in either patient group. Most children with negative appendectomy had body weight appropriate for age (11 cases), while overweight was observed in 4 children and 2 children were underweight. When comparing the rate of negative appendectomy between boys and girls, a statistically non-significant predominance was observed in girls (10 cases).

The incidence of chronic appendicitis is estimated at 1.5% of all cases of appendicitis, and its diagnosis is quite challenging due to milder symptoms and the lack of well-defined diagnostic criteria; indeed, the existence of this nosological entity remains a matter of debate [25, 26]. According to some authors, the main morphological criteria of chronic appendicitis include alteration of the appendiceal lumen shape, absence or minimal neutrophilic infiltration, mucosal atrophy or subatrophy, mucosal sclerosis, submucosal sclerosis, muscular sclerosis or atrophy, and lipomatosis; total sclerotic changes of the appendiceal wall are frequently observed [27].

Reactive lymphoid hyperplasia represents a benign response of appendiceal lymphoid tissue to antigenic stimulation and was the most frequent finding in cases of negative appendectomy performed through open surgery. In laparoscopic appendectomies, lymphoid hyperplasia was observed less frequently. This lesion, which often clinically mimics acute appendicitis, may be triggered by viral infections, gastrointestinal disorders, or autoinflammatory conditions. It is characterized by the absence of histopathological signs of inflammation and is usually diagnosed only after surgical removal of the appendix [28, 29]. Some ultrasonographic studies suggest that appendiceal lymphoid hyperplasia may be considered when a hypoechoic pseudonodular thickening of the appendiceal mucosa is detected in the absence of periappendiceal inflammatory changes [30]. Although, in our study, most cases of appendiceal lymphoid hyperplasia documented in open appendectomy were observed without other associated pathological changes, among negative laparoscopic appendectomies we identified one case associated with an intraluminal mucosal septum and two cases associated with the presence of helminths in the appendiceal lumen, despite the absence of definitive histological signs of transmural inflammation. The presence of helminths within the appendiceal lumen was identified both in some specimens from patients undergoing open surgery for acute appendicitis and in cases of negative open appendectomy.

Particular attention should be paid to the five cases of negative open appendectomy in which the intraoperative diagnosis established by the surgeon was acute catarrhal appendicitis, whereas the morphopathological examination revealed features of appendiceal ganglioneuropathy (fig. 4A). Histologically, the lumen was free, deformed, and slightly ectatic. The mucosal folds were attenuated, with a mamillated appearance at the level of some follicles; the epithelium was thinned with a reduced goblet cell component, while the crypts were within conventional normal limits. The mucosa showed a moderate increase in lymphocytic cellularity. The submucosa was thickened, with fibro-adipose islands and dispersed lipocytes in the submucosal zone, accompanied by scattered lymphocytic infiltration and a reduced number of lymphoid follicles, some with germinal centers. In the submucosal layer, in close proximity to the muscular layer, pseudomyxomatous/edematous changes and dystrophic alterations were observed. The inner muscular layer showed disjunction and edema, with moderate atrophy in some areas, whereas the outer layer was intact. In these cases, the myenteric (Auerbach) ganglioneuronal structures were heterogeneously distributed – intramuscularly located – with a decreased number of ganglion cells (hyponeuria) and clusters of neurons exhibiting swelling and dystrophic degeneration. The serosa showed an anemic vascular network, with some vessels slightly hyperemic (fig. 4B). Importantly, no signs of acute inflammation were identified in the submucosa, muscular layer, or serosa.

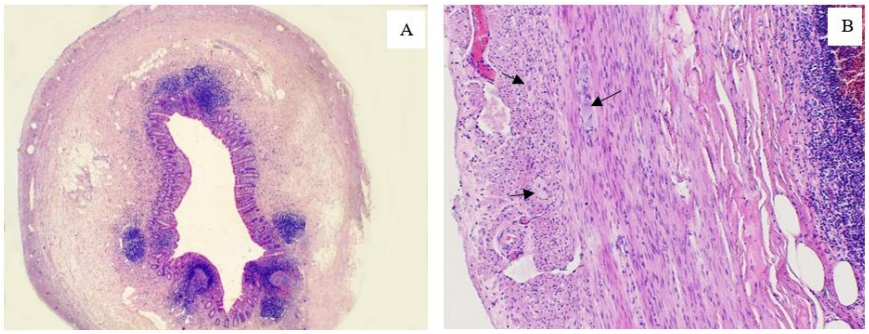

Fig. 4. Excised appendix in cross-section showing anoxic–discirculatory changes in a case of ganglioneuronal heterotopia (A). B – Heterogeneous appendiceal myenteric ganglioneuropathy, with hyponeuronia and dystrophic neuronal degeneration in the absence of acute inflammation, accompanied by mild thinning of the mucosal–submucosal zone and moderate atrophy of the inner muscular layer.

Neurogenic appendicopathy represents a distinct pathological entity, first described in 1921 by Maresch in Vienna and Masson in France. This condition is also referred to as neurogenic/neuroimmune appendicitis or neurogenic hyperplasia. It is characterized by the presence of pale spindle-shaped cells and proliferation of Schwann cells within the lamina propria of the mucosa or in the distal segments of the appendix, with increased activity of neuropeptides such as substance P and vasoactive intestinal peptide. The interaction between nerve fibers and neuropeptides is considered to play a determinant role in the pathogenesis of acute abdominal pain [31]. Some authors regard neurogenic appendicopathy as a form of neuroinflammation, although the pathogenesis of this entity remains unclear, including the mechanisms underlying the generation of acute abdominal pain, as well as the development of fibrosis and nerve fiber hyperplasia [32]. Höfler H. (1980) proposed a classification of neurogenic appendicopathy, distinguishing between a mucosal type, a submucosal form with neuromuscular proliferation, and an axial neuroma type [33]. We consider that the role of ganglioneuronal heterotopia within the muscular layer, associated with hyponeuronia and dystrophic neuronal degeneration, should be taken into account in the pathogenesis of neurogenic appendicopathy.

Parasites represent a less common cause of appendicitis, with *Enterobius vermicularis* being the most frequently reported etiological agent in the literature [34]. At the same time, the role of this parasite in the pathogenesis of appendicitis has remained controversial since its first report in the appendiceal lumen at the end of the nineteenth century [35]. In our study, *Enterobius vermicularis* was the most frequently identified parasite, and it was also observed in some laparoscopically managed cases of chronic appendicitis with signs of acute exacerbation (fg. 5).

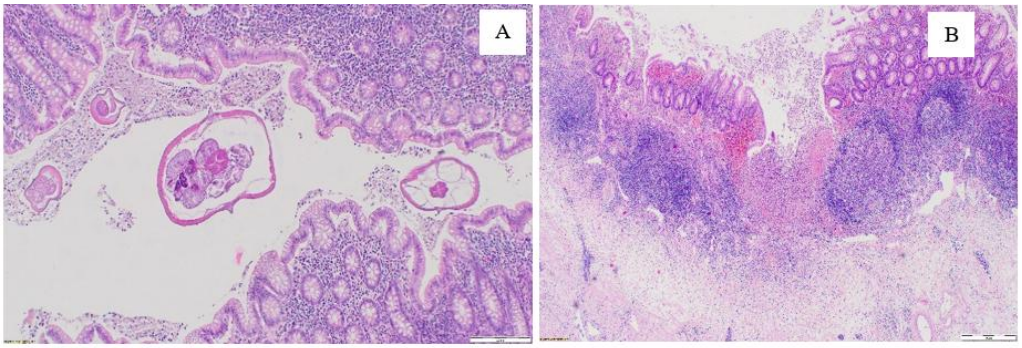

Fig. 5. Histological findings showing abundant helminthic invasion of the proximal appendiceal segment (A) on a background of active chronic appendicitis, with distal ulcerative-pseudopolypoid and phlegmonous changes (B).

Some authors have demonstrated the asymptomatic presence of appendicoliths in up to 32% of patients undergoing non-appendiceal surgical procedures [36]. At the same time, the intraluminal presence of appendicoliths may be associated with recurrent episodes of abdominal pain, and in some cases, they are identified in patients with acute appendicitis, including cases complicated by appendiceal perforation [37]. It is noteworthy that appendicolith pathology was first described in 1813, and in 1906 Weisflog reported the radiographic characteristics of calcified appendicoliths [38].

Analyzing our histologically confirmed cases of acute phlegmonous and gangrenous appendicitis, we observed that in some of them coprolitic obliteration of the appendiceal lumen was identified, with the development of segmental ulcerative-phlegmonous and pyogenic changes, as well as microperforations (fig. 6). Our findings are consistent with data reported in the literature, supporting the hypothesis first demonstrated by Wangensteen and Dennis (1939), according to which luminal obstruction is the primary triggering factor in acute appendicitis, leading to increased intraluminal pressure, subsequent venous congestion, and bacterial proliferation [36,39]. Based on our results and the available literature, we conclude that the presence of appendicoliths represents a potential risk factor that may promote appendiceal luminal obstruction and predispose to the development of acute appendicitis. In this context, we support the view that in cases where an appendicolith is visualized radiologically or laparoscopically – particularly in children presenting with right iliac fossa pain – laparoscopic appendectomy is recommended and should not be classified as negative appendectomy.

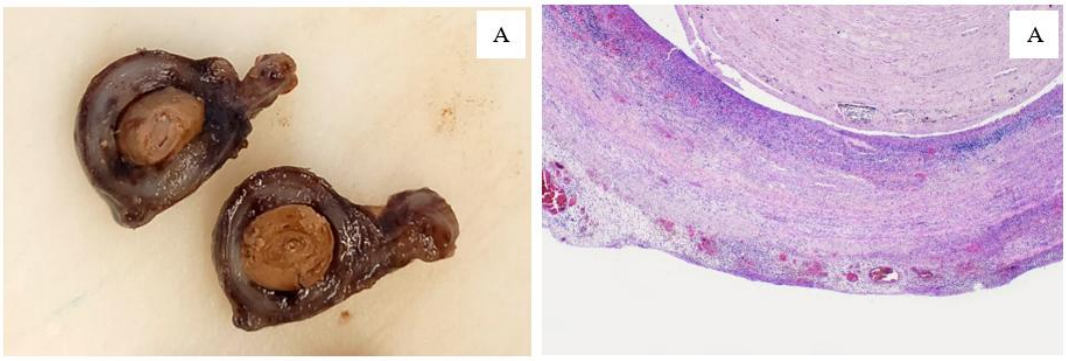

Fig. 6. A – Macroscopic cross-sectional appearance of appendiceal lumen obliteration by a coprolith measuring 1.2 cm in diameter, located in the mid-portion. B – Histological appearance characteristic of acute phlegmonous appendicitis, segmentally associated with coprolithic obliteration and signs of fibrinoleukocytic periappendicitis.

Among the unusual histopathological findings in specimens from negative open appendectomies were the incidental detection of one case of well-differentiated carcinoid tumor and one case of malignant non-Hodgkin lymphoma. Appendiceal carcinoids are rare malignant neuroendocrine tumors of the gastrointestinal tract in children, first recognized in 1867 [40]. These tumors are rarely associated with clinical symptoms, and the vast majority are discovered incidentally in children operated on for suspected appendicitis during histopathological examination of the resected appendix, as was the case in our patient. The incidence of appendiceal carcinoids diagnosed at the time of appendectomy is not precisely known, ranging between 0.09% and 1.5% [41]. Neuroendocrine tumors of the appendix originate from neuroendocrine cells located in the mucosal crypts, as well as from subepithelial neuroendocrine cells present in the lamina propria and submucosa of the appendiceal wall. On macroscopic examination, small tumors and those detected incidentally are usually not visible, whereas larger lesions may exhibit a yellowish surface. The tip of the appendix should be thoroughly examined to avoid overlooking small tumors [42]. Histology is essential for establishing the diagnosis (Fig. 7). These neuroendocrine tumors are composed of large nests, trabeculae, ribbons, and tubular structures formed by uniform polygonal tumor cells. The tumor cells display granular eosinophilic cytoplasm and characteristic stippled ("salt and pepper") chromatin. The tumor may extend toward the mucosal surface, causing ulceration, or infiltrate more deeply into the muscularis propria, mesoappendix, and adjacent structures.

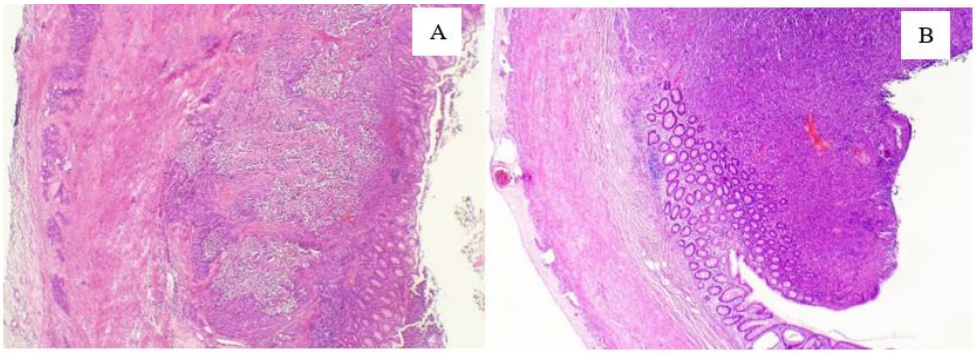

Fig. 7. Histological appearance of a well-differentiated appendiceal carcinoid tumor G1 (NET G1), with perineural invasion present and no lymphovascular invasion identified. No extra-appendiceal extension was observed. Tumor size: 0.8 cm. Resection margins were negative.**Conclusion:** Appendiceal carcinoid G1, pT1, R0, LVI0, Pn1.

Appendiceal carcinoid tumors are considered to grow relatively slowly and generally have a favorable prognosis, which largely depends on tumor size, regarded as a key indicator for assessing malignant potential. Appendiceal tumors measuring less than 2 cm are considered to have no metastatic potential, and those smaller than 1 cm may be treated by appendectomy alone. In contrast, tumors exceeding 2 cm in diameter are typically managed by right hemicolectomy. However, controversy persists regarding the optimal surgical management of appendiceal carcinoids measuring 1–2 cm and the role of right hemicolectomy in these cases [41,43].

Extranodal lymphoma is most frequently identified in the gastrointestinal system, most commonly involving the stomach. Extranodal lymphoma localized in the appendix is almost always B-cell non-Hodgkin lymphoma, which is included among malignant tumors of the appendix and was first described in 1899 by Warren [44]. The case identified in our study had a 3–4-month history of constipation, with bowel movements occurring once every 2–3 days in small amounts. Three days prior to surgery, dull, persistent abdominal pain developed, with progressive worsening, localized to the right lower quadrant. The child also presented with tenderness on

palpation and a positive Rovsing sign. Ultrasonographic examination was inconclusive. The patient underwent surgical treatment for presumed acute appendicitis, and an open appendectomy was performed. The case was initially considered a negative appendectomy; however, histological examination of the resection specimen established the diagnosis of malignant non-Hodgkin lymphoma with intramural appendiceal infiltration and involvement of the appendiceal mesenteric segment (fig. 8). Primary appendiceal lymphoma is extremely rare, being detected in approximately 0.013% of all appendectomy specimens. Appendiceal non-Hodgkin lymphoma is characterized by a clinical picture dominated by nonspecific symptoms, often mimicking acute appendicitis. In most cases, the definitive diagnosis of appendiceal non-Hodgkin lymphoma is established postoperatively following histopathological examination [45].

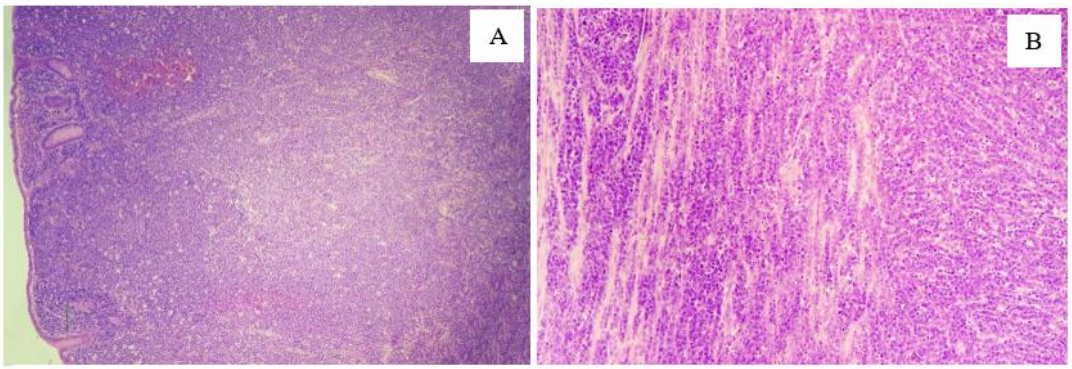

Fig. 8. Histological appearance of malignant non-Hodgkin lymphoma with intramural appendiceal infiltration and involvement of the appendiceal mesenteric segment.

Acute appendicitis in children is one of the most common causes of abdominal pain requiring urgent surgical intervention and demands a broad differential diagnosis, thereby increasing the risk of delayed diagnosis and the development of severe complications with prolonged hospitalization. It has also been reported that false-negative decisions in the diagnosis of acute appendicitis in children – when a child with acute appendicitis is incorrectly diagnosed as not having the condition – range from 3.8% to 15%. False-positive decisions, leading to overdiagnosis of acute appendicitis, result in unnecessary surgical interventions, increasing healthcare costs and exposing patients to potential intraoperative or postoperative complications, as well as prolonged hospital stays or readmissions [46, 47].

The identification of a macroscopically normal appendix during open surgery or laparoscopy performed for suspected acute appendicitis presents a clinical dilemma. Several authors recommend removal of a normal-appearing appendix in the absence of other explanatory pathology during laparoscopy for right iliac fossa pain, supporting the view that macroscopic assessment lacks diagnostic accuracy compared with histopathological findings. The reported diagnostic accuracy of intraoperative assessment for appendicitis is approximately 92%, with a risk of underestimating disease severity. According to some studies, inflammatory changes are detected histologically in nearly one-third of cases in which the appendix appears macroscopically normal [8,48]. Moreover, authors argue that removal of a macroscopically normal appendix during laparoscopy is justified by the fact that, in some cases, histological examination may reveal underlying appendiceal pathology not evident on visual inspection [49]. At the same time, other authors consider that leaving the appendix in situ – unless it is macroscopically inflamed – is a viable alternative to excision, citing the very low incidence of subsequent development of histologically confirmed appendicitis. Furthermore, removal of a macroscopically normal appendix exposes the patient to potential complications, including local infection, intra-abdominal abscess formation, prolonged ileus, enterocutaneous fistula formation, and others, while unnecessarily utilizing medical resources, prolonging hospital stay, and increasing healthcare costs [50]. Additionally, some authors question the role of laparoscopic appendectomy in reducing the rate of negative appendectomy [51].

The results observed in our study regarding the incidence of negative appendectomy in children are relatively comparable to those reported in other studies [52, 53]. Although some authors report a lower rate (2.9%), they define negative appendectomy strictly as the excision of a histologically normal appendix [18].

Therefore, the findings of our study allow us to conclude the following:

1. Laparoscopic appendectomy represents a feasible option for reducing the incidence of negative appendectomy in children.
2. The term “negative appendectomy” in children should be redefined in pediatric surgery based on the implementation of new strategies aimed at improving diagnostic accuracy, including video laparoscopy, which

– together with a high index of suspicion for certain misleading diagnoses – may contribute to reducing the risk of unnecessary surgical interventions and avoiding negative appendectomy in children.

3. Histopathological examination of appendiceal resection specimens in children should be considered mandatory and justified even in cases where the appendix appears macroscopically normal, given the potential to identify unusual histopathological findings in negative appendectomy specimens from children with a clinical suspicion of acute appendicitis.

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