

Intra-Appendiceal Migration of a Copper Intrauterine Device: Case Report and Literature Review

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Abstract: Extrauterine migration of intrauterine devices is rare, with an estimated incidence between 0.1% and 0.3%, and intra-appendiceal location represents an exceptional finding. We report the case of a 32-year-old patient who, after postpartum insertion of a copper intrauterine device, presented with pelvic pain and absence of retrieval strings on gynecological examination. Initial ultrasonography and magnetic resonance imaging did not localize the device, which was identified only three years later by plain abdominal radiography and confirmed by computed tomography, demonstrating migration to the appendix. The patient underwent videolaparoscopic appendectomy with complete removal of the device and had a favorable postoperative course. A systematic literature review was associated with the case report, identifying 17 patients described in 14 publications. Ages ranged from 21 to 44 years, with exclusive involvement of copper intrauterine devices. Most patients presented with abdominal pain, while a significant proportion were diagnosed incidentally. The interval between insertion and detection varied widely, reaching up to 12 years. Plain radiography was the most frequently used initial examination, while computed tomography confirmed the diagnosis in nearly all cases. Videolaparoscopic appendectomy was the predominant approach, associated with adequate recovery and a low complication rate. Intra-appendiceal migration should be considered in cases of non-visualization of intrauterine device strings or nonspecific abdominal symptoms. Immediate radiological investigation, initiated with plain radiography and complemented by computed tomography when necessary, is essential to avoid diagnostic delays. The laparoscopic approach remains a safe and effective treatment.

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1. Introduction

Intrauterine devices (IUDs) are among the most widely used long-acting reversible contraceptive methods worldwide due to their high efficacy, low cost, and minimal maintenance requirements [1,2]. Despite their overall favorable safety profile, complications such as uterine perforation and extrauterine migration may occur, with an estimated incidence ranging from 0.1% to 0.3%, varying according to the type of device, the postpartum period, the timing of insertion, and the operator's experience [3,4]. Extrauterine migration most commonly involves adjacent pelvic or abdominal structures, such as the bladder, rectosigmoid colon, and omentum [5,11].

Migration of an IUD to the appendix is an exceptionally rare manifestation, described almost exclusively in isolated case reports. This specific location has particular clinical

relevance, as it often mimics common surgical conditions, such as acute appendicitis or chronic right lower quadrant pain, favoring diagnostic delay and inappropriate prolonged conservative management. The rarity of appendiceal involvement, combined with nonspecific clinical presentation, contributes to underdiagnosis and the lack of well-established diagnostic protocols.

The pathophysiological mechanisms of IUD migration are not fully elucidated. Early migration is generally attributed to unrecognized uterine perforation at the time of insertion, whereas late migration appears to result from progressive erosion through the myometrium, facilitated by chronic inflammatory processes, reactions to the device material, and visceral movements [7,11]. In such situations, the IUD may reach intestinal structures after a long asymptomatic interval, resulting in heterogeneous clinical presentations, ranging from incidental findings to acute abdomen [9,13].

From a diagnostic standpoint, transvaginal ultrasonography is considered the initial examination in the investigation of an IUD with absent retrieval strings; however, its sensitivity decreases significantly for extrauterine locations. Magnetic resonance imaging may also fail to identify the device, particularly in intestinal segments, due to artifacts and gas interposition [14]. In contrast, plain abdominal radiography and computed tomography remain the most reliable methods for locating migrated metallic devices and are widely recommended after inconclusive ultrasonographic examinations [15]. Nevertheless, the lack of standardization in the diagnostic sequence contributes to relevant delays, with potential clinical and ethical implications.

Although previous reviews have addressed IUD migration in a comprehensive manner, focusing on incidence, risk factors, and more frequent anatomical destinations [3,7], evidence specifically regarding intra-appendiceal migration remains scarce and fragmented. In this context, we present the case of a patient with a delayed diagnosis of copper IUD migration to the appendix, treated with videolaparoscopic appendectomy, together with a systematic review of the literature aimed at synthesizing all published cases and discussing the underlying mechanisms, diagnostic challenges, and surgical strategies employed.

2. Methods

This literature review was prospectively registered. The study followed the PRISMA 2020 guidelines for reviews and the Cochrane methodology for reviews of observational studies and case reports.

2.1 Eligibility criteria

Case reports and case series describing migration of an intrauterine device (IUD) to the cecal appendix, confirmed by imaging studies or surgical findings, were considered eligible, regardless of IUD type, time since insertion, or clinical presentation. Studies were included if they provided information on patient demographics, type of IUD, time to diagnosis, symptoms, imaging examinations performed, therapeutic approach, and clinical outcome. Excluded were reports of migration to other organs without appendiceal involvement, experimental studies, review articles without original case descriptions, and conference abstracts lacking complete data.

2.2 Search strategy, study selection, and data extraction

We conducted a search of PubMed, ScienceDirect, MEDLINE, Google Scholar, and the Cochrane Library from inception through July 2025. The search strategy combined controlled terms (MeSH/Emtree) and free-text keywords, including: (“intrauterine device” OR “IUD”) AND (“migration” OR “perforation”) AND (“appendix” OR “appendicitis”). Reference lists of included studies and previous reviews were manually examined to identify additional publications.

Study selection was performed in two stages: (1) screening of titles and abstracts; and (2) full-text review to confirm eligibility. Two reviewers independently performed study selection and data extraction. Disagreements were resolved by consensus or, when necessary, by a third reviewer. Extracted data included: patient characteristics (age, parity, gynecological history); IUD characteristics (type, time since insertion); clinical presentation (symptoms, duration, physical findings); diagnosis (imaging modalities used, findings); treatment (surgical approach—laparoscopy or laparotomy—and associated procedures); and outcomes (postoperative course, complications, follow-up).

2.3 Outcomes

The primary outcome was confirmed intra-appendiceal localization of the IUD. Secondary outcomes included clinical presentation, initial diagnostic method, surgical modality used, and postoperative complications.

2.4 Methodological quality assessment

The quality of case reports and case series was assessed independently by two reviewers using the JBI Critical Appraisal Checklist for Case Reports (Moola et al., 2020). Items evaluated included clarity of patient history description, temporal sequence of events, details of the intervention, and outcomes. Risk of bias was classified as low, moderate, or high.

3. Case Report

3.1 Patient information

A 32-year-old female patient, born and residing in Manaus, Amazonas, Brazil, working as a data protection officer. Christian religion. Past medical history: no known comorbidities and no previous surgical history. Obstetric history: gravida 2, para 2, abortions 0 (G2P2A0).

3.2 Clinical history and initial presentation

On May 14, 2022, six months postpartum following a vaginal delivery, the patient underwent insertion of a copper intrauterine device (IUD) without immediate complications. At the follow-up visit 30 days after the procedure, she reported persistent pelvic pain. During gynecological examination, the IUD retrieval strings were not visualized at the cervical os, prompting imaging investigation. The information is summarized in Table 1.

Table 1. Timeline of the patient's clinical and diagnostic events.

Data	Evento
14/05/2022	Inserção de DIU de cobre no 6º mês pós-parto vaginal. Procedimento sem intercorrências imediatas.
06/2022	Consulta de retorno com queixa de dor pélvica persistente; exame ginecológico sem visualização dos fios do DIU.
06/2022	USG transvaginal: DIU não identificado. RM de pelve: ausência de visualização do DIU.
2022–2025	Seguimento clínico conservador; início de anticoncepcional oral combinado para contracepção.
12/02/2025	RX de coluna lombar solicitado por outra indicação; achado incidental de imagem radiopaca compatível com DIU.
27/02/2025	TC de abdome e pelve: DIU localizado no interior da luz do apêndice cecal, sem sinais de abscesso.

12/06/2025	Cirurgia videolaparoscópica: apendicectomia e retirada do DIU com uso de endobag. Achados intra-operatórios: apêndice aderido à parede abdominal anterior, bloqueio inflamatório, DIU no terço distal do apêndice.
Pós-operatório imediato	Evolução sem intercorrências. Alta hospitalar em boas condições.
Seguimento	Paciente assintomática; boa recuperação; aguardando laudo histopatológico.

3.3 Subsequent symptoms and physical examination findings

The patient reported intermittent right lower quadrant (RLQ) pain of a colicky nature, with radiation to the ipsilateral lumbar region. She noted exacerbation of symptoms on cold and rainy days. She denied fever, changes in bowel habits, weight loss, or other systemic symptoms. On physical examination, there was mild pain on deep palpation of the RLQ, a negative Blumberg sign, and no signs of peritoneal irritation. Abdominal auscultation was normal. The patient was afebrile and in good general condition.

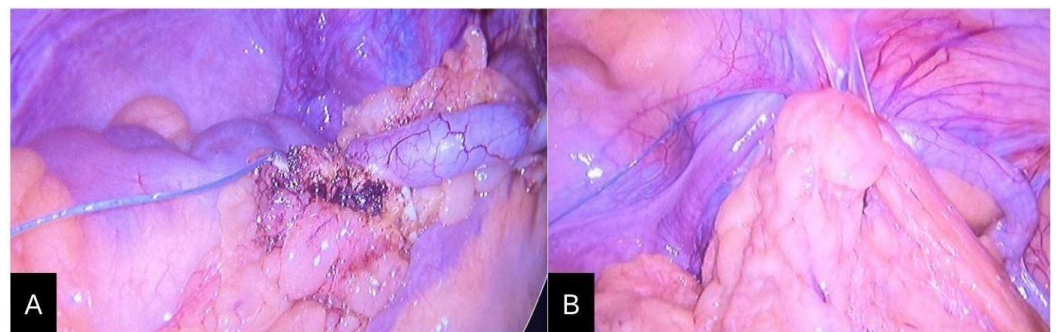
3.6 Final diagnostic hypothesis

Extrauterine migration of an intrauterine device due to probable uterine perforation, with intra-appendiceal localization confirmed by computed tomography.

3.7 Therapeutic intervention

On June 12, 2025, the patient underwent a videolaparoscopic surgical procedure (Figure 1). During exploration of the abdominal cavity, the following intraoperative findings were observed: the cecal appendix was adherent to the anterior abdominal wall, associated with a localized inflammatory block, without signs of free intestinal perforation or diffuse peritonitis. In the distal third of the appendix, a copper intrauterine device was identified, partially penetrating the appendiceal lumen, consistent with a process of progressive erosion and late secondary migration. A standard appendectomy was performed (Figure 2), followed by removal of the IUD using an endobag in order to minimize the risk of contamination and intra-abdominal dissemination. The surgical specimen was sent for histopathological examination.

Figure 1. A. Omental block in the topography of the cecal appendix. B. Intra-appendiceal intrauterine device.



3.8 Postoperative course and follow-up

The postoperative period was uneventful. The patient was discharged from the hospital in good clinical condition, with scheduled outpatient follow-up. She remains asymptomatic and in full functional recovery, awaiting the histopathological report of the appendix.

Figure 2. Surgical specimen obtained by videolaparoscopic appendectomy, demonstrating the cecal appendix and the copper intrauterine device removed from an intra-appendiceal location.



4. Systematic Review

4.1 Study selection

The study selection flowchart, presented in Figure 1, summarizes the screening process of the present review. A total of 1,003 records were identified through searches of Google Scholar (825), ScienceDirect (173), MEDLINE (4), and the Cochrane Library (1). After removal of 154 duplicate records, 849 studies underwent title and abstract screening, resulting in the exclusion of 765 records. The remaining 84 articles were retrieved for full-text review and assessed for eligibility. Of these, 70 were excluded for not meeting the predefined inclusion criteria based on the PICOT framework. Ultimately, 14 studies met the criteria and were included in the qualitative synthesis of the review.

4.2 Characteristics of the included studies

The selected studies consisted of thirteen case reports and one case series (Table 2) [2–15]. Sample size ranged from one to three patients per study, totaling 17 cases of intra-appendiceal IUD migration. All patients were female, aged between 21 and 44 years, and had a history of copper intrauterine device use. The interval between IUD insertion and diagnosis ranged from 6 months to 12 years. The most common clinical presentation was abdominal pain (76.5%) [2,4,5,6,7,8,9,10,13,14], followed by asymptomatic cases incidentally detected on imaging studies (23.5%) [3,11,12,15].

From a diagnostic perspective, plain radiography was used as the initial examination in 92.8% of cases [2–15], while computed tomography served as the confirmatory method in 100% of cases (all studies). Pelvic ultrasonography, although frequently requested initially, failed to identify the IUD in any case of migration [4–11,15]. Treatment was exclusively surgical, with videolaparoscopic appendectomy performed in 78.5% of cases [5–13,15] and laparotomy in 21.5% [2–4,14]. No study reported severe postoperative complications. Follow-up ranged from 1 month to 2 years, with complete symptom resolution in all cases.

Figure 1. PRISMA 2020 Flow Diagram – Selection of Studies Included in the Review.

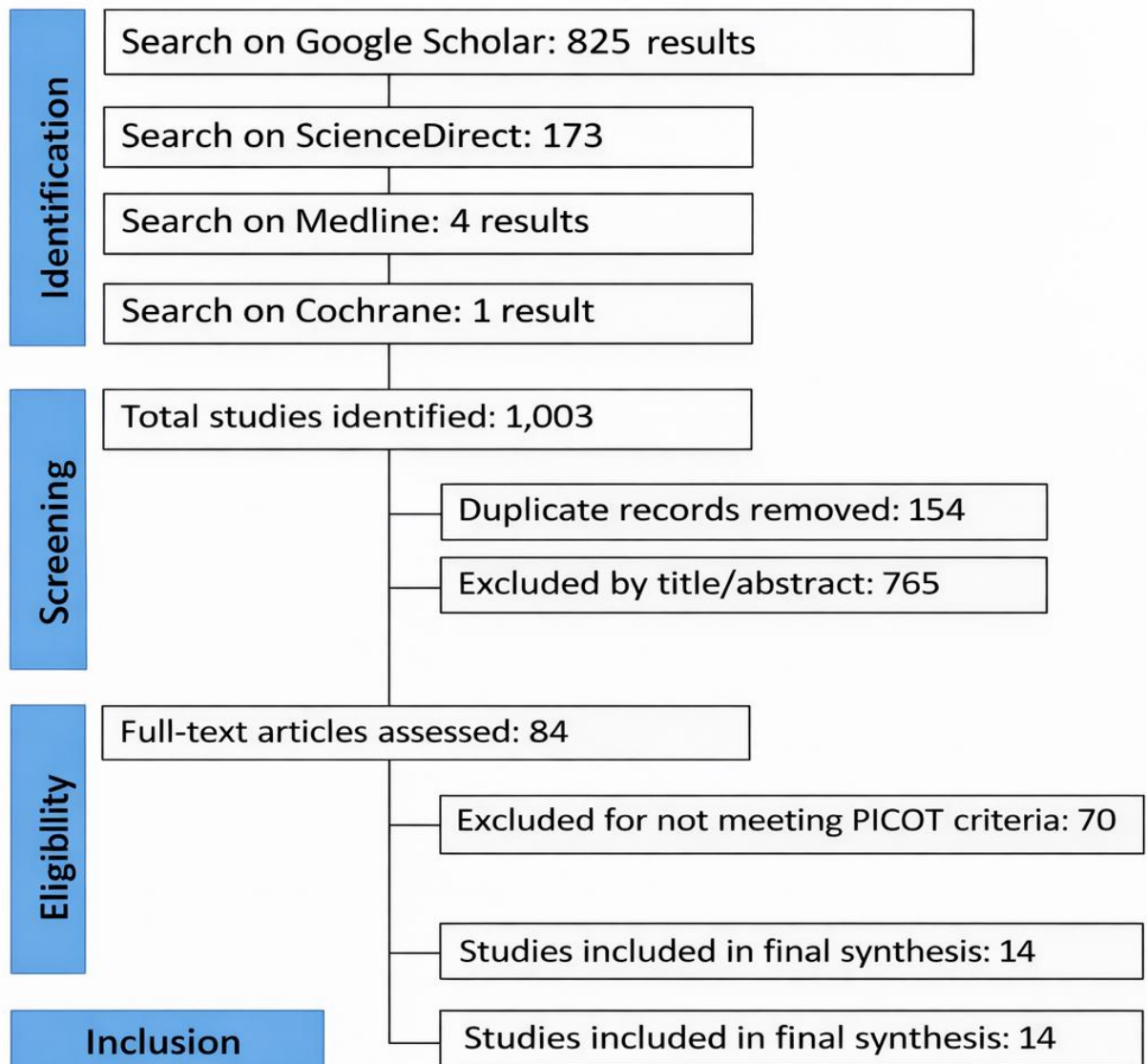


Table 2. Characteristics of included studies on intra-appendiceal migration of intrauterine devices (IUDs).

Reference	Country	Age	IUD type	Interval from inser- tion to diagnosis	Symptoms	Diagnostic tests	Surgical approach	Outcome
[2]	Egypt	32	Copper	2 years	RLQ pain	X-ray, CT	Laparotomy + appendectomy	Discharged without complications
[3]	Turkey	29	Copper	4 years	Asymptomatic	X-ray, CT	Laparotomy + appendectomy	Discharged without complications
[4]	Turkey	42	Copper	8 years	RLQ pain	US, X-ray, CT	Laparotomy + appendectomy	Discharged without complications
[5]	Iran	35	Copper	5 years	RLQ pain	US, X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[6]	Nigeria	30	Copper	7 years	RLQ pain	US, X-ray, CT	Laparoscopy + appendectomy	Discharged without complications

[7]	Malaysia	25	Copper	3 years	RLQ pain	US, X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
	China	31	Copper	6 years	RLQ pain	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
	China	33	Copper	4 years	RLQ pain	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[8]	China	29	Copper	9 years	Asymptomatic	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
	China	36	Copper	3 years	RLQ pain	US, X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[9]	India	28	Copper	2 years	RLQ pain	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[10]	India	27	Copper	6 months	RLQ pain	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[11]	United Kingdom	34	Copper	10 years	Asymptomatic	US, X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[12]	United Kingdom	33	Copper	4 years	Asymptomatic	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[13]	India	21	Copper	1 year	RLQ pain	X-ray, CT	Laparoscopy + appendectomy	Discharged without complications
[14]	Pakistan	38	Copper	12 years	RLQ pain	X-ray, CT	Laparotomy + appendectomy	Discharged without complications

4.3 Thematic synthesis of findings

4.3.1 Clinical presentation

Chronic or intermittent right lower quadrant pain was the predominant symptom [2,4–14]. In asymptomatic patients, detection was incidental during radiological investigation performed for other reasons [3,11,12,15].

4.3.2 Diagnostic imaging

Plain radiography was fundamental in indicating the presence of the IUD outside the pelvic cavity, whereas computed tomography was required to confirm intra-appendiceal localization and to plan the surgical approach (all studies). Pelvic ultrasonography demonstrated low sensitivity for detecting extrauterine devices in an appendiceal location [4–11,15].

4.3.3 Surgical management

Videolaparoscopic appendectomy was the predominant approach, associated with rapid recovery and absence of major complications [5–13,15]. In cases with intense inflammation, extensive adhesions, or technical difficulty, laparotomy was employed [2–4,14].

5. Discussion

Extrauterine migration of intrauterine devices (IUDs) is an uncommon complication, with an estimated incidence between 0.1% and 0.3% of insertions [1]. Intra-appendiceal localization represents an exceptionally rare manifestation of this condition, with distinct

clinical implications. Our case describes a patient with a delayed diagnosis of IUD migration to the cecal appendix, identified approximately three years after insertion and successfully managed with videolaparoscopic appendectomy.

5.1 Comparison with literature

The synthesis of the 14 included studies [2–15] shows that patient age ranged from 21 to 44 years, with exclusive involvement of copper IUDs, as in the present report. The interval between insertion and diagnosis varied from 6 months to 12 years, reflecting the frequently insidious nature of this complication. Most patients presented with persistent abdominal symptoms. Right lower quadrant pain was the predominant presentation, observed in 76.5% of cases [2,4–10,13,14], whereas 23.5% were asymptomatic [3,11,12,15]. Our case fits this temporal and symptomatic profile, although diagnosis was significantly delayed. As described in [4,5,7], the patient reported intermittent pain without systemic signs, which initially favored a conservative approach. However, considering the synthesized literature, this diagnostic delay constitutes a critical and instructive aspect of the present case.

5.2 Diagnostic aspects and delay in identification

Pelvic ultrasonography has low sensitivity for detecting IUDs migrated to the appendix [4,5,11], a pattern also observed in our case, in which both ultrasonography and magnetic resonance imaging failed to localize the device. These limitations are particularly relevant for extrauterine intestinal locations. In contrast, plain abdominal radiography proved highly effective in the literature, serving as the initial examination in 92.8% of reviewed cases, while computed tomography confirmed migration in virtually all reports. In the present case, the absence of early abdominal radiography after nondiagnostic examinations contributed to a nearly three-year delay in diagnosis. This finding reinforces the need to incorporate plain radiography as a mandatory step in the evaluation of missing IUD strings, especially after inconclusive ultrasonography. Such delays may have relevant clinical, ethical, and medico-legal implications, in addition to potentially allowing progression of migration and local inflammatory processes.

5.3 Pathophysiological mechanism of migration

The main proposed mechanisms include primary uterine perforation at the time of insertion or late secondary erosion induced by chronic inflammatory reaction [7,11]. In the present case, intraoperative findings, including dense adhesions, a localized inflammatory block, and partial penetration of the appendiceal lumen, associated with a long asymptomatic interval strongly favor the hypothesis of late secondary migration rather than immediate primary uterine perforation. Appendiceal migration appears to occur after initial intraperitoneal displacement, followed by adhesion formation and progressive erosion of the appendiceal wall, a process possibly facilitated by chronic inflammatory response to copper and visceral mobility. This interpretation is consistent with most available reports and should be prioritized in cases with delayed presentation.

5.4 Considerations regarding device type

A relevant finding of the review was the exclusive involvement of copper IUDs in all published cases of intra-appendiceal migration. Although causality cannot be established, factors such as structural rigidity, device shape, and copper-induced chronic inflammatory response may contribute to this pattern. Alternatively, this finding may reflect the historically higher prevalence of copper IUD use in regions where cases were reported. Regardless of the underlying mechanism, this observation warrants emphasis and further investigation.

5.5 Surgical management

Videolaparoscopic appendectomy was the preferred approach in 78.5% of cases [5–13,15], associated with rapid recovery and a low complication rate. Our management followed this trend. Laparotomy was reserved for specific scenarios, such as intense inflammation, extensive adhesions, or technical limitations, as described in a minority of reports [2,4,14]. Thus, laparoscopy should be considered the approach of choice in stable patients, with open surgery remaining a valid alternative in selected situations.

5.6 Clinical implications

The present case reinforces three key points: (1) immediate evaluation of missing IUD strings, with mandatory complementary radiological investigation after inconclusive ultrasonography; (2) the limitations of ultrasonography in excluding extrauterine migration; and (3) laparoscopy as the treatment of choice, given its diagnostic and therapeutic roles.

5.7 Limitations and research agenda

The available literature consists predominantly of isolated case reports, limiting generalizability and robust statistical analyses. There are no consistent data on specific predisposing factors for appendiceal migration, nor standardized diagnostic protocols. Although prospective studies are unlikely due to the rarity of the condition, updated systematic reviews and multicenter collaborations may help consolidate evidence and guide clinical recommendations.

6. Conclusion

Intra-appendiceal migration of intrauterine devices is an extremely rare, clinically relevant, and potentially underdiagnosed complication, particularly in the absence of specific symptoms or when initial imaging examinations fail to locate the device. This case report, together with a systematic review of 14 studies, demonstrates that diagnostic delay is frequent and represents a critical aspect of this condition. Non-visualization of IUD strings should prompt immediate and systematic diagnostic investigation, including plain abdominal radiography and, when necessary, computed tomography, regardless of the intensity, chronicity, or intermittency of symptoms.

When feasible, videolaparoscopic appendectomy remains a safe and effective approach, combining diagnostic and therapeutic value, enabling definitive treatment and favorable postoperative recovery. Increased awareness among healthcare professionals regarding this uncommon presentation and the adoption of standardized diagnostic algorithms have the potential to reduce diagnostic delays, minimize clinical risks, and avoid ethical and medico-legal implications associated with prolonged conservative management.

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