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Inguinal Hernia Containing Uterus and Adnexa in a Female Infant: A Rare Case Report from Libya

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ABSTRACT

Inguinal hernias containing reproductive organs represent an exceptionally rare clinical presentation in female infants. While ovarian herniation occurs in approximately 15–20% of female inguinal hernias, concurrent uterine involvement is extraordinarily uncommon, with fewer than 50 cases documented worldwide. This presentation carries significant implications for long-term fertility and reproductive function. A 40-day-old term female infant presented with acute-onset painful right inguinal swelling. Ultrasonography with colour Doppler assessment revealed an irreducible inguinal hernia containing the right ovary, fallopian tube, and uterine fundus, with preserved vascular perfusion. The anesthetic management employed a rapid sequence induction with ketamine to ensure cardiovascular stability, complemented by rigorous thermoregulatory strategies to maintain neonatal normothermia. Surgical exploration via open inguinal approach confirmed complete herniation of Müllerian structures through a widely patent processus vaginalis. All organs were successfully reduced with meticulous preservation of vascular supply. Postoperative recovery was uneventful except for a superficial wound infection on postoperative day 5, managed successfully with conservative local care without systemic antibiotics. No hernia recurrence was observed at one-month follow-up. This rare presentation underscores the necessity of high clinical suspicion and prompt diagnostic imaging with Doppler assessment in female infants presenting with inguinal swelling. Urgent surgical intervention with organ-preserving techniques and specialized neonatal anesthesia management remains essential to prevent complications, including vascular compromise, torsion, and long-term reproductive morbidity. When managed appropriately, excellent outcomes can be achieved while preserving future fertility potential.

Introduction

Inguinal hernia represents one of the most frequently encountered surgical conditions in pediatric practice, with an incidence ranging from 0.8% to 4.4% in children, with the highest prevalence during the first year of life and in premature infants [1,2]. The male-to-female ratio approximates 6:1, reflecting the later natural obliteration of the processus vaginalis in males compared to females.[1] In female infants presenting with inguinal hernias, involvement of ovarian and fallopian tube tissue occurs in approximately 15–20% of cases [3,4]. However, concurrent herniation of uterine tissue through the inguinal canal constitutes an exceptionally rare clinical entity, with fewer than 50 well-documented cases reported in the peer-reviewed international literature [5–7]. When reproductive organs herniate through the inguinal canal in females, the herniation typically represents a true sliding hernia, wherein the affected organ comprises part of the hernia sac wall rather than existing as free intraluminal content. This anatomical configuration results from the combination of a patent processus vaginalis (known as the canal of Nuck in females) with predisposing anatomical factors, including abnormally elongated ovarian ligaments and incomplete fixation of embryologic Müllerian structures, which collectively enhance organ mobility [8,9].

The clinical implications of reproductive organ herniation are substantial. Herniated ovarian tissue faces considerable risk of vascular compromise through torsion (reported in up to 43% of cases), incarceration, and strangulation [10,11]. Delayed recognition or inadvertent organ injury during surgical management may result in permanent organ loss or dysfunction, with lifelong consequences for reproductive capacity and hormonal homeostasis in these young patients [10,11]. Therefore, early clinical recognition combined with prompt surgical intervention remains essential for preserving reproductive potential.

This report documents the successful management of a rare case of complete herniation of the right ovary, fallopian tube, and uterus in a 40-day-old female infant managed at Misurata Medical Center, Libya. To our knowledge, this case represents one of the first well-documented examples of this condition from the North African region and contributes to the limited international literature on this uncommon clinical presentation.

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Case Presentation

A 40-day-old female infant born at term via uncomplicated spontaneous vaginal delivery without perinatal complications presented to the Paediatric Surgery Department with acute-onset right inguinal swelling accompanied by significant pain. According to Parental history, swelling was first noted approximately one week before presentation, and was initially intermittently reducible. However, the mass progressively became firm, tender, and irreducible over the 24–48 hours preceding medical evaluation, prompting urgent clinical assessment.

Physical examination revealed an alert but irritable infant with vital signs within normal limits for age. The right inguinal region demonstrated a firm, tender, non-reducible mass measuring approximately 3 × 2 cm. The overlying skin appeared unremarkable without erythema, warmth, or evidence of skin breakdown. The mass did not transilluminate. Gentle palpation elicited marked discomfort. Examination of the left inguinal region revealed no abnormalities. The remainder of the abdominal examination was benign with normal bowel sounds and no hepatosplenomegaly.

High-resolution ultrasonography with colour Doppler assessment was performed as the primary imaging modality, consistent with current evidence-based recommendations supporting ultrasound as the diagnostic standard for inguinal masses in female infants [12,13]. Imaging revealed a heterogeneous mass at the right inguinal canal measuring approximately 3X2 cm containing an ovary with a characteristic follicular pattern (2-4 follicles) with one dominant follicle, a tubular echogenic structure representing the fallopian tube, and uterine fundal tissue confirmed by the characteristic multilayered wall. Colour Doppler imaging demonstrates preserved arterial and venous flow within ovarian and uterine tissue, indicating viable tissue. No free fluid identified within the hernia. Imaging findings were consistent with an irreducible inguinal hernia containing viable ovary, fallopian tube, and uterus—a diagnosis confirmed in only a limited number of cases in the international literature (figure 1).

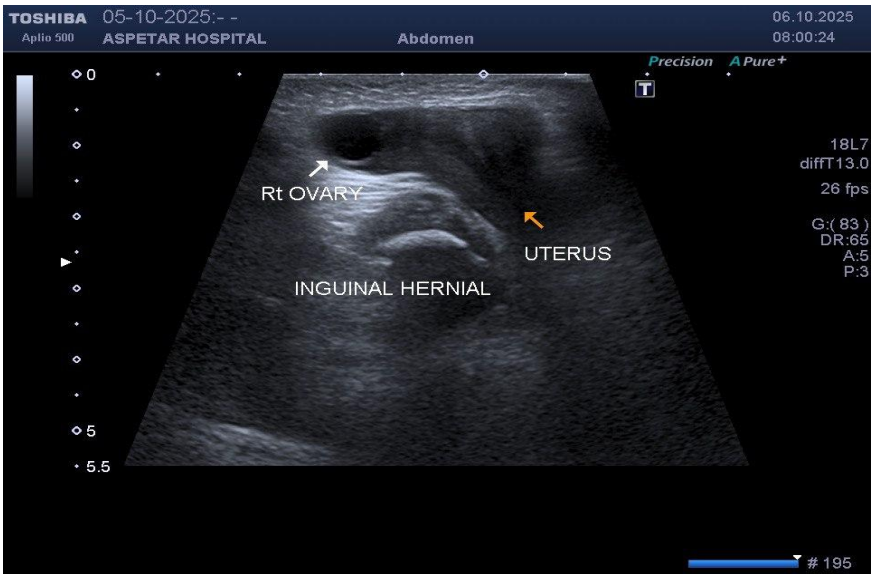

Figure 1. Right inguinal ultrasound showing an inguinal defect and ovary, fallopian tube, and part of the uterus as content

The presence of an irreducible hernia, acute pain suggesting potential vascular compromise, preserved Doppler perfusion, and the well-established risk of torsion and strangulation in hernias containing reproductive organs necessitated urgent surgical intervention. Preoperative laboratory evaluation, including complete blood count, electrolytes, and coagulation studies, was within normal limits. Following consultation with the paediatric anaesthesia team and informed parental consent, the patient was scheduled for immediate operative intervention.

Anaesthesia in neonates and young infants undergoing emergency surgical procedures presents unique challenges distinct from older paediatric populations. At 40 days of age, this patient was within a critical developmental window characterized by limited physiologic reserve and potentially divergent pharmacodynamic responses to anaesthetic agents compared to older children [21,22].

Neonatal airway anatomy differs substantially from that of older children and adults. Relative anatomical features include a proportionally larger head, prominent occiput, relatively enlarged tongue, and more cephalad positioning of the larynx with anterior angulation [22,23]. The epiglottis is omega-shaped and relatively mobile, potentially complicating direct laryngeal visualization during intubation. The narrowest

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point of the paediatric airway is located at the cricoid ring rather than at the glottis as in adults, necessitating careful endotracheal tube selection and intubation technique [22]. These anatomical considerations required experienced neonatal airway management and assessment of alternative airway equipment.

A 40-day-old female infant, weighing 5.0 kg, presented for emergency repair of an incarcerated inguinal hernia. Given the urgent nature of the procedure and the 4-hour nil per os (NPO) status, a Rapid Sequence Induction (RSI) protocol with full aspiration precautions was instituted [24]. Standard monitoring, including five-lead electrocardiography, pulse oximetry, capnography, and continuous temperature monitoring, was established. To counteract the high vagal tone characteristic of neonates and prevent bradycardia during laryngoscopy, atropine (0.1 mg intravenous [IV]; 0.02 mg/kg) was administered as a pre-induction agent [25]. Following pre-oxygenation, RSI was executed. Ketamine (10 mg IV; 2 mg/kg) was selected as the induction agent for its sympathomimetic properties, which were critical for maintaining hemodynamic stability in this potentially volume-unresuscitated patient [26]. This was followed by fentanyl (10 mcg IV; 2 mcg/kg) to provide analgesia. Neuromuscular blockade was achieved with rocuronium (6 mg IV; 1.2 mg/kg). The high-end dose of rocuronium was utilized to ensure a rapid onset comparable to succinylcholine, which was deliberately avoided due to the recognized risk of life-threatening hyperkalaemia in infants with undiagnosed myopathies [27]. Direct laryngoscopy facilitated successful tracheal intubation with a 3.0 mm cuffed endotracheal tube, with placement confirmed by capnography and bilateral chest auscultation. This approach successfully avoided excessive hemodynamic fluctuation in a critically ill neonatal patient.

Anaesthesia was maintained using sevoflurane (2.5%–3.0% end-tidal concentration) and pressure-controlled ventilation (PCV), targeting normocapnia with an end-tidal carbon dioxide ($EtCO_2$) concentration maintained between 35 and 45 mmHg. The ventilatory parameters were set to a Peak Inspiratory Pressure (PIP) of 15–20 cm H_2O, a Positive End-Expiratory Pressure (PEEP) of 3–5 cm H_2O, an inspired oxygen fraction (FiO_2) of 0.40%–0.50%, and a respiratory rate of 40–50 breaths per minute. Young infants demonstrate a limited capacity to compensate for hemodynamic changes induced by positive pressure ventilation and anaesthetic agents. Even modest increases in intrathoracic pressure from mechanical ventilation or excessive PEEP can significantly reduce venous return and cardiac output in this age group [29,30]. Mechanical ventilation was maintained utilizing gentle PCV to minimize fluctuations in intrathoracic pressure and preserve cardiac preload. The 4-hour NPO period resulted in a calculated fasting fluid deficit (FFD) of 80 mL (4 mL/kg/hr-4*5*4) [28]. Intravenous fluid management was initiated with warmed Lactated Ringer's solution. Given the patient's emergency status and short procedural duration (45 minutes), the strategy prioritized the administration of the maintenance rate (20 mL/hour) and titration to hemodynamic stability, deferring aggressive FFD replacement to the postoperative period to avoid volume overload in the neonatal period [29].

Neonates demonstrate impaired thermoregulation and heightened susceptibility to perioperative hypothermia, which can prolong emergence from anaesthesia and increase postoperative complications [30]. Meticulous temperature control was paramount. Active warming measures, including a forced-air warming blanket, administration of warmed intravenous fluids, and the use of heated and humidified inspired gases, were continuously employed. These interventions successfully maintained the patient's core temperature within the narrow therapeutic range of 37.0–37.5°C. Anaesthetic induction proceeded smoothly despite the anatomic challenges and physiologic peculiarities inherent to neonatal anaesthesia. The patient tolerated mechanical ventilation throughout the 45-minute operative procedure with hemodynamic stability (HR 120–158 bpm, SBP 68–78 mmHg), adequate oxygenation (SpO_2 >95%), and appropriate ventilation (end-tidal CO_2 35–45 mmHg). Emergence from anaesthesia was prompt and uncomplicated, with successful extubation in the operating room following confirmation of adequate spontaneous ventilation and intact airway protective reflexes [29,30].

Under general anaesthesia with endotracheal intubation, the patient was positioned supine with standard sterile preparation and draping of the right inguinal region. A standard open inguinal approach was utilized. A 2 cm transverse inguinal crease incision was placed extending from the midline toward the anterior superior iliac spine. Systematic dissection through the subcutaneous tissue and external oblique fascia was performed with careful identification and mobilization of the round ligament. Upon opening the hernia sac, the following structures were identified and directly visualized (Figure 2).

The right ovary measured 1.2 × 0.8 cm with normal pink coloration and consistency, indicating preserved viability. There was no evidence of torsion, haemorrhage, or necrotic change, and the surface follicles were consistent with normal ovarian tissue. The right fallopian tube was identified extending from the ovary through the hernia sac toward the internal ring, measuring 0.5 cm in diameter with normal pink coloration and intact peristaltic activity. The uterine fundus was observed as a component of the hernia sac wall in a sliding hernia configuration, measuring 1.5 cm in maximal dimension with normal gross appearance and intact vascular attachment. The internal inguinal ring was patent, measuring 0.8 cm in diameter, clearly defining the hernia defect. No free intraperitoneal fluid, adhesions, or evidence of recent torsion were identified, and all herniated organs demonstrated excellent vascular perfusion intraoperatively.

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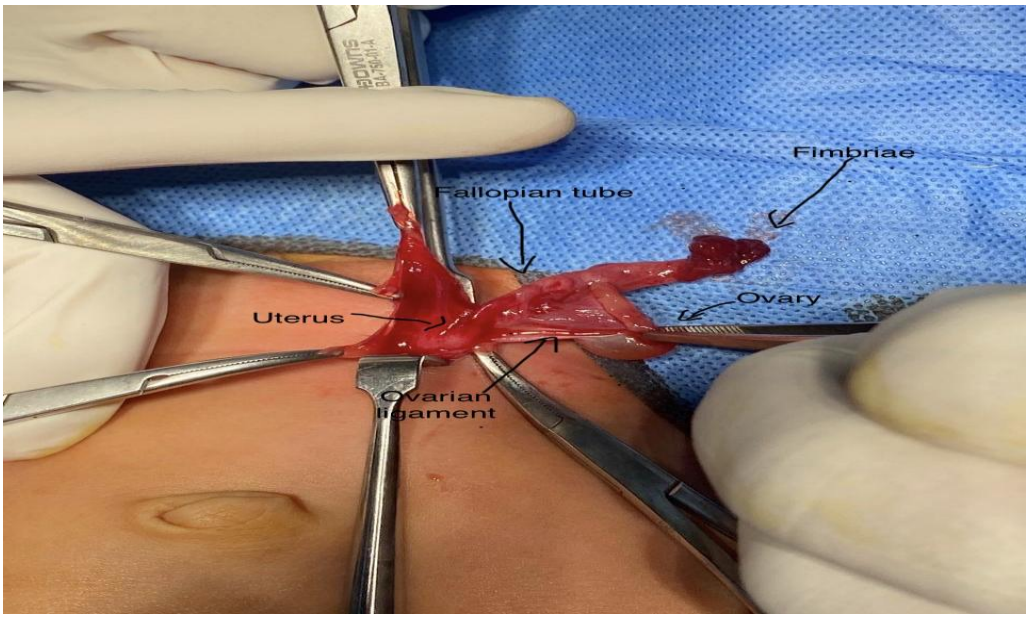

Figure 2. Intraoperative findings confirmed the ultrasound result, showing the right ovary, fallopian tube, and fundus of the uterus as the hernia content

All herniated structures were carefully reduced into the peritoneal cavity utilising gentle caudal and medial traction, confirming normal gross appearance and preserved vascular supply following reduction. The hernia sac was meticulously dissected from the round ligament with particular attention to the sliding hernia component involving the uterine attachment. High ligation of the hernia sac was performed at the internal ring level using 3-0 polyglactin absorbable suture, ensuring complete closure without compromise to the reduced organs. Excessive tension was avoided to preserve vascular supply to the reduced structures. The external oblique aponeurosis was closed with a continuous 4-0 absorbable suture. Subcutaneous tissue and skin closure were performed in standard layered fashion with 5-0 absorbable sutures. No mesh reinforcement was used, consistent with standard paediatric hernia repair practice and avoidance of foreign material in young patients.

Elective contralateral inguinal exploration was deferred, given the urgent clinical presentation and successful reduction of viable organs on the operated side. Parents received comprehensive counselling regarding increased contralateral patent processus vaginalis risk and were advised to seek urgent surgical evaluation should future inguinal or abdominal swelling develop. Operative time 45 minutes; estimated blood loss <5 mL; preoperative antibiotic prophylaxis with cefazolin 25 mg/kg administered at incision; no specimens submitted for histopathologic examination.

The patient recovered uneventfully from general anaesthesia without complications. Postoperative analgesia was provided using acetaminophen and mild opioid analgesics as needed. Oral feeding was tolerated, and urine output remained appropriate. Vital signs remained stable throughout the immediate postoperative period. On postoperative day 5, a superficial wound infection was identified during routine dressing change, characterised by localised erythema and minimal serous purulent drainage at the skin closure site. Conservative management was initiated with daily dressing changes and local wound care without requiring systemic antibiotic therapy. The superficial skin suture was removed to facilitate adequate drainage. Daily wound cleaning with sterile gauze and application of mupirocin ointment was prescribed. This approach avoided unnecessary antibiotic exposure in the neonatal period while achieving complete resolution. The patient was discharged on postoperative day 2 in excellent clinical condition. Parents received detailed instructions regarding wound care techniques, activity restrictions, and warning signs warranting urgent re-evaluation. At two-week follow-up, parents reported the infant was recovering well with complete resolution of inguinal swelling, complete wound infection, normal feeding, and appropriate diaper output. In-person clinical examination at one month postoperatively confirmed excellent wound healing with minimal scarring and a complete absence of hernia recurrence, ongoing wound complications, or other adverse events. The inguinal region appeared normal with no palpable masses bilaterally. The infant was meeting all developmental milestones appropriate for chronological age.

Discussion

This case represents an exceptionally rare presentation of paediatric inguinal hernia with complete herniation of the right ovary, fallopian tube, and uterus. To our knowledge, this case constitutes one of the first well-documented examples from Libya and the broader North African region. The rarity of this condition

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is highlighted by the fact that fewer than 50 cases have been reported in the worldwide peer-reviewed literature [5,7]. The complete triad of Müllerian structure herniation is particularly uncommon, as many published cases document only partial herniation involving the ovary and fallopian tube without uterine involvement. Right-sided presentation, while common in general paediatric inguinal hernia practice, represents a variation from the left-sided predominance reported in many reproductive organ herniation series [6,9].

The processus vaginalis constitutes an evagination of the parietal peritoneum developing during fetal life. Typically, this structure is obliterated by the eighth month of gestation in males [15,16]. In females, failure of obliteration results in persistence of the canal from the internal inguinal ring through the inguinal canal to the labia majora, accompanying the round ligament of the uterus. This patent structure, termed the canal of Nuck (first described by Dutch anatomist Anton Nuck in 1691), provides a potential pathway for intra-abdominal and pelvic structure herniation [14,17].

Normal development and fixation of Müllerian-derived structures may be incomplete in certain individuals, predisposing to herniation. Anatomically elongated utero-ovarian ligaments and abnormal suspensory ligament fixation render reproductive organs more mobile and susceptible to herniation through a patent canal of Nuck [8,9]. The precise anatomic factors predisposing specifically to uterine herniation remain incompletely understood; however, anatomic variants in pelvic ligament length and tissue fixation appear to play substantial contributory roles. The relatively elevated intra-abdominal pressure generated during crying and straining in infants, combined with the anatomic proximity of female reproductive organs to the internal inguinal ring, likely facilitates organ herniation in susceptible individuals [8].

Herniated ovarian tissue faces a substantial risk of torsion around its vascular pedicle, occurring in up to 43% of ovarian inguinal hernias [10]. Torsion results in venous and lymphatic obstruction with consequent tissue edema, vascular compromise, ischemia, and potential organ necrosis [11]. Early recognition and prompt detorsion remain essential for preserving ovarian function and long-term reproductive capacity.

Irreducible hernias containing reproductive organs remain at considerable risk for vascular compromise through fascial compression, resulting in tissue ischemia and necrosis [18,19]. In this case, the acute presentation with pain and irreducibility suggested possible early vascular compromise, appropriately supporting urgent surgical intervention.

Loss of ovarian tissue or uterine injury carries profound long-term consequences for reproductive function and hormonal homeostasis. Preservation of reproductive organs remains paramount in female infants, as such outcomes carry implications extending decades into the future [18,20]. Unlike typical intestinal-containing hernias, reproductive organ hernias may present atypically and require advanced imaging for accurate preoperative diagnosis, potentially resulting in delayed treatment and increased complication risk [12,13]. High-resolution ultrasonography with color Doppler assessment constitutes the imaging modality of choice for evaluating inguinal masses in female infants, providing multiple diagnostic advantages. Ovarian tissue can be identified by its characteristic follicular pattern of 2–4 mm follicles within hypoechoic parenchyma, while uterine tissue is distinguished by the echogenic endometrial stripe and hypoechoic myometrium. Tubular echoic structures representing patent fallopian tubes may also be visualized within the hernia sac. Doppler imaging allows assessment of arterial and venous flow, enabling discrimination between viable and non-viable tissue and directly informing management urgency. Ultrasound reliably differentiates reproductive organ herniation from other inguinal masses such as lymphadenopathy, canal of Nuck hydrocele, or rare malignancies [20], while avoiding ionizing radiation exposure in infants. In this case, preoperative ultrasound with Doppler assessment accurately identified all herniated structures and confirmed tissue viability, with findings demonstrating precise concordance with intraoperative observations, supporting ultrasonography as a highly reliable diagnostic tool when performed by experienced operators.

Urgent surgical intervention is indicated for reproductive organ hernias presenting with pain, irreducibility, or compromise, while uncomplicated hernias may warrant brief observation. In this case, immediate operative management was required. Both open inguinal herniotomy and laparoscopic approaches have been reported [5], but an open approach was selected based on urgent presentation, young patient age, need for meticulous organ handling, and institutional expertise, providing optimal visualization and tactile feedback for delicate reproductive structures. Gentle tissue handling is paramount to minimize iatrogenic injury, with careful assessment of organ viability and vascular perfusion before reduction. Vascular pedicles must be preserved to maintain blood supply, detorsion must be performed cautiously when torsion is present, and oophorectomy must be reserved only for clearly necrotic organs. Narrowing of the internal ring is necessary to prevent recurrence, but must be achieved without compromising vascular patency. Sac ligation requires meticulous technique, particularly in sliding hernias, to avoid inadvertent injury. Organ preservation remains the guiding surgical philosophy, recognizing the lifelong implications for fertility and reproductive health. Mesh reinforcement is avoided in pediatric hernia repair due to concerns about long-term complications, and contralateral exploration remains controversial, with some advocating routine

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bilateral exploration while others recommend selective approaches guided by clinical and imaging findings. In this case, selective management was adopted with parental counselling regarding warning signs.
Superficial wound infection on postoperative day five is not uncommon in neonatal surgery given the immature skin barrier. Conservative management with daily dressing changes and local wound care proved effective without systemic antibiotics, exemplifying optimal practice in minor superficial infection management and avoiding unnecessary neonatal antibiotic exposure. The infection resolved completely without impact on long-term outcomes or discharge planning. Extended surveillance remains important for monitoring recurrence, assessing reproductive structure growth and development, documenting normal pubertal progression, evaluating future fertility, and recognizing contralateral hernia development. Continued long-term follow-up is planned with periodic clinical assessment, particularly during adolescence.
A comprehensive literature review confirms the exceptional rarity of pediatric inguinal hernias containing uterine tissue. Published case reports and series consistently describe presentation during the first year of life, variable laterality with some series reporting left-sided predominance and others right-sided frequency, acute painful irreducible masses, occasional Müllerian duct anomalies, and generally excellent outcomes with early intervention and organ-preserving techniques. Higher incidence has been noted in premature infants [1,2,6,9]. The rarity of such cases underscores the importance of documenting and disseminating individual experiences to expand collective clinical knowledge and guide future management.

Conclusion

Inguinal hernias containing reproductive organs in female infants are exceptionally rare, with fewer than 50 cases of complete uterine involvement documented worldwide. We report successful management of a 40-day-old female infant presenting with irreducible right inguinal hernia containing ovary, fallopian tube, and uterine fundus. Preoperative Doppler ultrasonography confirmed viable herniated structures. Specialized neonatal anesthesia and urgent organ-preserving surgery achieved complete reduction without complications. Minor superficial wound infection was managed conservatively. No recurrence occurred at one-month follow-up. This case emphasizes critical management principles: maintaining high clinical suspicion in female infants with inguinal masses, utilizing Doppler ultrasound for accurate diagnosis and viability assessment, performing urgent surgical intervention to prevent torsion and organ loss, employing meticulous organ-preserving techniques, and ensuring extended follow-up for reproductive development monitoring. When these principles are rigorously applied, excellent outcomes with preserved fertility potential can be achieved. This case contributes valuable documentation from North Africa to the limited international literature, demonstrating that accurate diagnosis, prompt intervention, and technical precision enable successful management of these rare but clinically significant hernias.

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Conflict of Interest

The author declares no financial, professional, or personal conflicts of interest related to this case report or manuscript.

Ethical Approval

Written informed consent was obtained from the patient's parents for case report publication, including authorisation for clinical details and radiologic findings utilisation. Patient confidentiality was maintained throughout this report. This case report was reviewed and approved by the Institutional Ethics Committee of Misurata Medical Center.

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