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# Oncological background of non-specific abdominal pain in children and adolescents – case report of a girl with ovarian teratoma

## Onkologiczne podłoże nieswoistych dolegliwości bólowych jamy brzusznej u dzieci i młodzieży – opis przypadku nastolatki z potworniakiem jajnika

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## Abstract

Abdominal pain in children is a common, atypical symptom. The vast majority of abdominal pain is functional, non-life threatening and does not require extensive diagnostics. However, it should be remembered that the abdominal cavity is one of the most common locations of solid tumours in children. Carefully collected information and physical examination with oncological vigilance allow for the identification of alarming symptoms accompanying abdominal pain. These include: pain waking up from sleep, palpable mass in the abdominal cavity, vomiting, change in the rhythm of bowel movements, weight loss, fever, dysphagia, weakness, anaemia. The article presents a case report of a teenager with ovarian teratoma. It aims to illustrate the pitfalls and diagnostic difficulties associated with determining the causes of abdominal pain in children and adolescents. The discussion also summarises information on the epidemiology, aetiology and clinical symptoms of teratoma.

**Keywords:** abdominal pain, children, ovarian tumour, teratoma maturum

## Streszczenie

Bóle brzucha u dzieci są objawem częstym i nietypowym. Zdecydowana większość bólów brzucha ma charakter czynnościowy, niezagrażający życiu i niewymagający szerokiej diagnostyki. Należy jednak pamiętać, że jama brzuszna jest u dzieci jedną z najczęstszych lokalizacji guzów litych. Dokładnie zebrany wywiad i przeprowadzone badanie przedmiotowe z zachowaniem czujności onkologicznej pozwalają na identyfikację objawów alarmujących towarzyszących dolegliwościom bólowym brzucha. Są nimi m.in. ból wybudzający ze snu, wyczuwalna masa w jamie brzusznej, wymioty, zmiana rytmu wypróżnień, utrata masy ciała, gorączka, dysfagia, osłabienie i niedokrwistość. W artykule zamieszczono opis przypadku nastolatki z potworniakiem jajnika. Ma on na celu zobrazowanie pułapek i trudności diagnostycznych związanych z ustaleniem przyczyn dolegliwości bólowych brzucha u dzieci i młodzieży. W omówieniu podsumowano także informacje dotyczące epidemiologii, etiologii i objawów klinicznych potworniaka.

**Słowa kluczowe:** bóle brzucha, dzieci, guz jajnika, potworniak dojrzały

## INTRODUCTION

Along with infectious diseases of the respiratory tract, gastrointestinal complaints constitute one of the most common health problems in the paediatric population. Differentiation of the causes of abdominal pain in children and adolescents is difficult and requires clinical experience. On the other hand, abdominal pathologies may manifest themselves in a variety of ways[1].

In the majority of cases, the cause of complaints is chronic functional pain due to, e.g. abnormal intestinal motility, visceral sensation, abnormal interactions between the intestinal and central nervous systems with dysfunction of nerve pathways or disorders of psychosomatic origin[1,2].

Other causes of abdominal pain may include infectious and non-infectious inflammations within the intestines and other abdominal organs, poisoning, parasitic infestations, allergies and food intolerances. It should be remembered that some diseases and pathologies of other organs and systems may manifest with abdominal pain, especially in children, e.g. pneumonia, urinary tract infection, congenital angioedema, certain vascular and metabolic diseases (e.g. ketoacidosis, acute porphyria), Addison's disease breakthrough[1,2].

A separate group of paediatric patients reporting abdominal pain include those requiring urgent surgical intervention due to abdominal organ trauma, gastrointestinal perforation, obstruction or intense bleeding. Symptoms of the so-called acute abdomen involve sudden, severe, persistent pain, vomiting, gas and stool obstruction, and fever. Physical examination is then dominated by exacerbating tenderness on palpation, abdominal tension, peritoneal signs, thoracic breathing pattern, lack of peristalsis, and sometimes signs of shock[1,3].

Although neoplasms, including solid tumours: neuroblastoma, Wilms tumour (nephroblastoma), soft tissue sarcomas, hepatoblastoma and germinal tumours, constitute relatively rare causes of abdominal complaints in children, especially when alarming symptoms, so-called red flags, are reported (Tab. 1) – a possible oncological cause of the complaints should be excluded[4,5].

Due to the variety of possible causes of abdominal pain reported by the child, the diagnosis should always be established on the basis of a thorough interview and physical examination. Establishing the characteristics and localisation of the pain, as well as duration and dynamics of the symptoms, is essential for the diagnosis and implementation of an appropriate therapeutic process. In case of any doubt or if there is no improvement after the procedure, it is advisable to extend the diagnosis with laboratory and imaging tests.

The description of the below case study involving a teenage girl with ovarian teratoma is intended to illustrate the catches and diagnostic problems involving establishment of the cause of abdominal pain in children and adolescents that may be encountered by a physician of any specialisation. In the discussion, the authors focused on summarising information on the epidemiology, aetiology and clinical manifestations of an ovarian teratoma.

| "Red flags" – alarm symptoms accompanying abdominal pain in children |
|---|
| • Abdominal pain awakening from sleep |
| • A palpable mass in the abdominal cavity |
| • Vomiting |
| • Change in the rhythm of defecation |
| • Involuntary weight loss |
| • Fever of unknown aetiology |
| • Dysphagia |
| • Weakness |
| • Anaemia |
| • Delayed puberty |
| • Growth retardation |
| • Joint pains |

*Tab. 1. Alarming signs in gastrointestinal disorders in children[5]*

## CASE STUDY

A 15-year-old girl was admitted to the Department of Paediatrics, Paediatric Nephrology and Allergology on the 5th day of menstrual bleeding due to abdominal pain. On the day of admission, the patient reported a history of severe, stabbing abdominal pain located in the left lower quadrant, with a severity of 8/10 on the NRS (Numerical Rating Scale). The pain decreased in the sitting position and after administration of paracetamol. Moreover, the girl reported difficulty urinating and difficulty initiating miction, despite a sensation of urinary urgency. The first miction after an overnight stay on the day of admission took place around 12:00, accompanied by pain in the lower part of the patient's abdomen. Additionally, she denied symptoms of acute gastrointestinal or respiratory infection, including vomiting, diarrhoea, and increased body temperature. She also negated dietary error and abdominal trauma. The family history was irrelevant.

On admission, the girl was in a fairly good general condition, with full verbal-logical communication. Her baseline vital signs were typical for her age: blood pressure 109/69 mm Hg, heart rate 86/min, $SpO_2$ 98%, body temperature 36.8°C. On physical examination on admission to the Department, significant abnormalities were found, including pain on palpation in the lower abdomen. Moreover, the abdomen was soft, with preserved peristalsis in all quadrants, no peritoneal signs and pathological resistance, the urogenital region showing no signs of inflammation. The peripheral lymph nodes available on examination were not enlarged, the lung fields showed a normal alveolar murmur and regular heart function, clear heart tones on auscultation. In laboratory tests, inflammatory markers were not elevated, liver and renal function indices were normal (Tab. 2). The general urine examination did not show signs of infection, with only petty haematuria (Tab. 3). The diagnosis was extended with imaging studies – ultrasonography (USG) and radiography (X-ray) of the abdomen. Initially, the only



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| Parameter | Result | Laboratory standard |
|---|---|---|
| C-reactive protein (CRP) | <0.1 mg/dL | 0–0.8 |
| ESR | 13 mm/h | 0–12 |
| Alanine aminotransferase (ALT) | 14 U/L | 0–33 |
| Aspartate aminotransferase (AST) | 18 U/L | 0–31 |
| Creatinine | 0.8 mg/dL | 0.5–0.9 |
| eGFR | >90 mL/min/1.73 m$^2$ | 90 |
| Urea | 26 mg/dL | 15–43 |
| Lactate dehydrogenase (LDH) | 165 U/L | 135–223 |
| Native human chorionic gonadotropin + beta subunit (B-HCG) | <0.1 mIU/mL | 0–5 |
| Alpha-1-fetoprotein (AFP) | 3 ng/mL | 0–7 |
| Cancer antigen CA-125 | 11.14 U/mL | 0–35 |

*Tab. 2. Laboratory results of the patient*

| Colour | Bright yellow |
|---|---|
| Transparency | Complete |
| Specific gravity | 1.14 g/L (1.16–1.35) |
| pH | 7.0 (4.5–7.5) |
| Leukocytes | Not detected |
| Nitrites | Not detected |
| Protein | Not detected |
| Glucose | Not detected |
| Ketone bodies | Not detected |
| Urobilinogen | Standard |
| Bilirubin | Not detected |
| Blood | Detected |
| **Morphotic elements** | |
| Squamous epithelia | 1.3/µL (<45.6) |
| Leukocytes | 1.7/µL (<39.0) |
| Erythrocytes | 118.3/µL (<30.7) |
| Bacteria | <58/µL (<58) |

*Tab. 3. Result of the patient's general urine test*

abnormality visualised on ultrasound was 41 mm wide fluid within the pouch of Douglas (Fig. 1). An abdominal X-ray did not show any abnormalities.

Based on the overall clinical picture, the initial differential diagnosis included menstrual pain, constipation, urinary tract infection, urinary tract infection, urolithiasis, ovarian torsion and appendicitis.

Analgesic treatment was administered and the patient remained under hospital observation.

On the following day, palpation of the abdomen revealed a palpable tumour in the left mediastinum, several centimetres in a diameter. Abdominal ultrasound was repeated, which showed an ovary sized 16 × 33 mm on the left side, with an adjacent hypoechoic circular lesion sized 80 × 89 × 70 mm (Fig. 2). On ultrasound, the lesion moved towards the left hypochondrium. Suspecting a gynaecological background to the complaints described, the girl was referred for consultation.

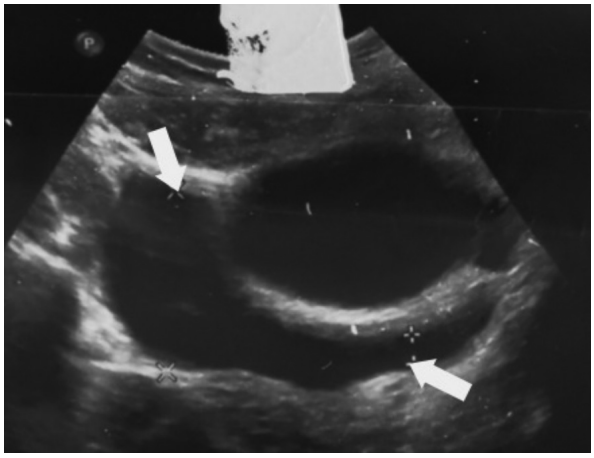

*Fig. 1. Abdominal ultrasound image – fluid in the pouch of Douglas*

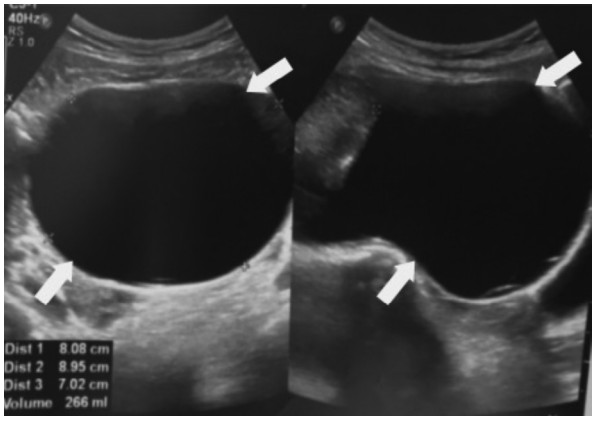


*Fig. 2. Abdominal ultrasound image – a circular lesion adjacent to the left ovary*

An abdominal ultrasound performed in the Department of Gynaecology showed a cystic lesion approximately 11 cm in diameter, with a solid part sized 44 × 36 mm, suggestive of a dermoid cyst. In addition, a right ovary of normal size and echogenicity and a normal uterus displaced to the left side were described (Fig. 3).

Laboratory diagnosis was extended by serum tumour markers (serum levels of chorionic gonadotropin, AFP, CA-125, LDH). The results were normal (Tab. 2). A computed tomography (CT) of the abdomen and pelvis was also performed to further visualise the lesion. The CT scan showed a large, heterogeneous focal lesion over the urinary bladder sized 83 × 100 × 74 mm, not enhancing on contrast medium, mainly with a fluid component, containing solid elements with fatty elements and calcifications (Fig. 4).

On this basis, a teratoma was suspected.

The girl was transferred to the paediatric surgery ward to be qualified for further treatment. Intra-operatively, a large litho-cystic tumour of the left ovary consistent of a teratoma was found. The tumour was excised within the limits of healthy tissue. The perioperative period was uncomplicated. Histopathological examination confirmed the diagnosis of mature teratoma (*teratoma maturum*):



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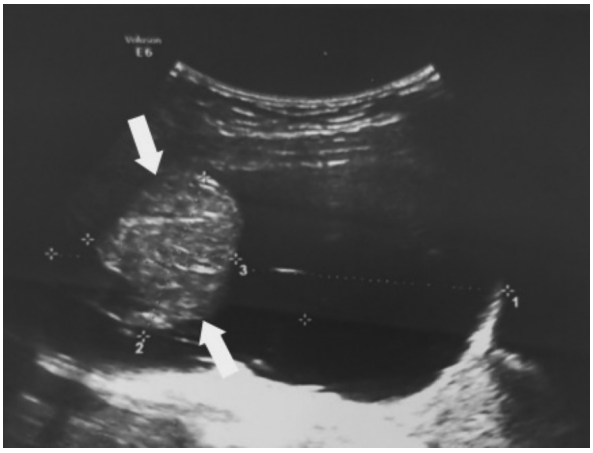

*Fig. 3. Abdominal ultrasound image – cystic lesion with a solid part in the left ovary*

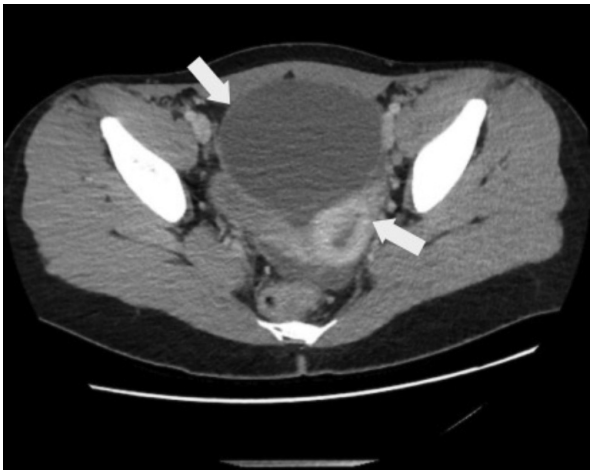

*Fig. 4. CT image of the abdomen – ovarian tumour*

**Macroscopically:** a partially dissected ovarian tumour sized 5.0 × 4.0 × 4.0 cm and a loose fragment sized 3.5 × 0.5 × 0.3 cm. Hard tissue elements (bone, cartilage) as well as sebaceous masses and hair were found in the solid part.

**Microscopically**, the ovary showed mature nervous tissue, adipose tissue, connective tissue, skin with skin appendages and hair, cartilaginous tissue, bone tissue, a fragment of follicular thyroid tissue and numerous glandular structures.

The patient was discharged in good general condition with recommendations for further care in the oncology clinic. She did not require intensified oncological therapy. Surgical treatment left no permanent consequences, including fertility disorders.

## DISCUSSION

There are two peaks in the incidence of germinal tumours in the paediatric population, the first under 2 years of age and the second during puberty[6].

Ovarian tumours in children are relatively rare, with an incidence of 2.6 per 100,000 girls per year. The most common of these is the mature teratoma, accounting for 10–20% of all ovarian tumours[7].

The teratoma is a neoplasm derived from pluripotent germinal cells differentiating themselves uncontrollably into cell lines with features of all germ layers: ectoderm, endoderm and mesoderm, and sometimes trophoblast cells. These tumours do not have a homogeneous histological structure, being a mixture of disorderly mixed tissues. Mature teratoma (Latin: *teratoma maturum* or *teratoma adultum*) contains a mixture of fully differentiated endodermal (e.g. glandular epithelium, intestinal epithelium, bronchial ciliated epithelium), mesodermal (e.g. cartilage, non-striated muscles, adipose tissue) and ectodermal (epidermal tissue, glia) tissues. The tissues of some mature teratomas can also produce hormones (most commonly thyroid hormones and serotonin). Immature teratomas (Latin: *teratoma immaturum*), on the other hand, contain tissues that are not fully mature histologically (e.g. immature neuroectoderm, immature epithelial structures). Within the tissues of a teratoma, i.e. a benign tumour, a teratocarcinoma (less commonly a sarcoteratoma) may sometimes develop[6,8].

Teratomas usually locate in the gonads. This also happened in the described case. Less commonly, the tumour is located in the midline of the body, which is associated with the movement of primary germ cells along the gastrocele mesentery into the gonads during embryonic life. In women, mature teratomas, i.e. tumours of a benign nature, are most commonly found in the ovaries. Immature teratomas and teratocarcinomas are more commonly found in the testicles in men[6]. In the case of mature teratoma, in 10% of patients the neoplastic process involves both gonads[6,8].

Initially, tumours may not cause any complaints and thus do not arouse oncological vigilance. The first symptoms usually appear due to the effect of the tumour mass. These include abdominal pain, flatulence and pathological resistance on abdominal palpation. In the case of hormonally active cancer, the first symptom may be precocious puberty, virilisation[8,9]. In addition, trophoblast cells, often a component of immature teratomas, can secrete chorionic gonadotropin (beta-HCG). This should be kept in mind when making a differential diagnosis in teenage girls with non-specific symptoms and a positive pregnancy test[9]. In the patient described here, chorionic gonadotropin levels were not testes during the initial diagnosis, as she was menstruating. However, the hormone concentration was determined on the following days of hospitalisation and the result was normal.

Dangerous complications, e.g. ovarian torsion, ovarian perforation and inflammation of the soft tissues of the pelvis or abdominal cavity, can occur due to tumour growth or displacement. A very rare complication reported in the literature is autoimmune encephalitis caused by antibodies to the NMDA receptor (*N*-methyl-D-aspartate receptor). The disease mainly affects women of childbearing age and in more than half of the cases it coexists with cancer, most commonly ovarian teratoma[8].



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Abdominal imaging diagnosis is crucial to establish the initial diagnosis. In the described patient, the tumour was not initially visualised on abdominal ultrasound, which could be explained by its unusual location and mixing due to changes in body position and deep palpation. An abdominal CT scan proved to be a more objective examination in this case. Difficulties in interpreting imaging findings may also arise from the individual histological differentiation of the tumour[9].

In the paediatric population, the treatment of choice is always surgery with fertility preservation. Most often, patients with a diagnosis of mature teratoma are completely cured without negative consequences or distant effects. A prerequisite, however, remains the early diagnosis[9,10]. It should also be emphasised that benign ovarian tumours occurring during adolescence may predispose to future cancer[8]. Therefore, even several decades after completion of therapy, constant oncological vigilance and regular follow-ups are necessary.

Any tumour detected should be differentiated towards a potentially malignant lesion. Some additional tests may prove helpful in differentiating potentially malignant lesions from benign ones, even before the histopathological diagnosis is established. On radiological imaging, malignant tumours of the ovary are in most cases solid or heterogeneous and relatively large (often larger than 8–10 cm). Tumour malignancy may additionally be indicated by elevated tumour markers detected in serum[8].

## SUMMARY

Abdominal pain in children is a common, atypical symptom. The vast majority of abdominal pain is functional. Carefully collected information and physical examination with oncological vigilance allow for the identification of patients requiring extended diagnostics, including towards conditions and diseases with potential risk to human life. In the differential diagnosis, one should always remember to exclude neoplastic causes of pain.

Surgery performed early enough often leads to full recovery of the child.

In any case, a prompt diagnosis with appropriately selected treatment can minimise the distant consequences and complications of the disease.

**Conflict of interests**

*The authors report no financial or personal relationships with other persons or organisations that could negatively influence the content of the publication and claim rights to this publication.*

**Author contribution**

*Original concept of study: SW, KT. Collection, recording and/or compilation of data: SW, KT. Analysis and interpretation of data: SW, KT. Writing of manuscript: SW, AB, KT. Critical review of manuscript: AB, AR. Final approval of manuscript: AB, AR.*

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