



## Burkitt lymphoma as a cause of intussusceptions – The significance of positron emission tomography scan in the follow-up

Barkitov limfom kao uzrok intususpcije – Važnost pozitronske emisione tomografije za praćenje bolesti

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### Abstract

**Introduction.** Burkitt lymphoma (BL) is a high-grade, high-risk type of non-Hodgkin lymphoma characterized by a very rapid cell progression. Although BL is a rare cause of intussusceptions, it must arouse suspicion if the intussusception occurs outside the characteristic peak. **Case report.** A previously healthy 7-year-old boy was hospitalized for recurrent abdominal pain, loss of appetite and body weight, a fever of up to 38°C, persistent vomiting and with soft tumefaction ileocecally. Nuclear magnetic resonance (NMR) revealed intussusceptions due to a tumor mass, which was followed by a surgical procedure (right hemicolectomy and termino-terminal anastomosis). Histopathological examination confirmed the diagnosis of primary abdominal Burkitt lymphoma. In spite of the subsequent oncologic treatment lasting for four months, an undifferentiated mass was detected in the retroperitoneal space below the lower pole of the right kidney. Positron emission tomography (PET) scan was performed in order to detect the metabolic activity of the deposit in the retroperitoneal space. A high metabolic activity of Burkitt lymphoma confirmed its presence, as well as the need for additional surgical intervention for tumor extirpation. PET scan undoubtedly contributed to distinguishing the visibility of tumor cells and to the detection of the subcentimeter tumor mass. **Conclusion.** The timely diagnosis, high tumor sensitivity to chemotherapy as well as the great importance of PET scan in the early detection of tumor recurrence, significantly increase the survival rate in patients with BL.

### Key words:

burkitt lymphoma; diagnosis, differential; intussusceptions; child; positron-emission tomography; digestive system surgical procedures; antineoplastic combined chemotherapy protocols.

### Apstrakt

**Uvod.** Barkitov limfom (BL) je visokomaligni tip ne-Hoćkinovog limfoma koji se odlikuje jako brzom ćelijskom progresijom. Iako je BL retko uzročnik intususpcije uvek mora da se posumnja na njega ukoliko se ista pojavi van karakterističnog uzrasnog pika. **Prikaz bolesnika.** Prethodno zdrav 7-godišnji dečak primljen je na lećenje zbog abdominalnog bola, gubitka apetita i telesne mase, febrilnosti do 38°C, upornog povraćanja i tumefakcije u projekciji ileocekalne regije. Nuklearna magnetna rezonanca (NMR) ukazala je na postojanje invaginacije posledično na terenu tumorske mase, zbog čega je usledila hirurška intervencija (desna hemikolektmja sa termino-terminalnom anastomozom). Patohistološki pregled potvrdio je dijagnozu primarnog abdominalnog BL. Uprkos sledstvenoj onkološkoj terapiji, četiri meseca nakon operacije detektovana je nejasno lokalizovana masa u retroperitonealnom prostoru, ispod donjeg pola desnog bubrega. Pozitron emisiona tomografija (PET) učinjena je u cilju otkrivanja metaboličke aktivnosti depozita u retroperitonealnom prostoru. Visoka metabolička aktivnost BL potvrdila je njegovo postojanje i potrebu za ponovnom hirurškom intervencijom u cilju tumorske ekstirpacije. PET sken nesumnjivo doprinosi vizualizaciji tumorskih ćelija u detekciji subcentimetarskih tumorskih masa. **Zaključak.** Pravovremena dijagnoza, veliki senzibilitet tumorskih ćelija na hemoterapiju i veliki značaj i uloga PET u ranom otkrivanju tumorskog recidiva, značajno doprinose povećanju preživljavanja bolesnika sa BL.

### Ključne reči:

limfom, burkitt; dijagnoza, diferencijalna; intususpcija; deca; tomografija kompjuterizovana, emisiona; hirurgija digestivnog sistema, procedure; lećenje kombinovanjem antineoplastika, protokoli.

## Introduction

Burkitt lymphoma (BL) is a high-grade, high-risk type of non-Hodgkin lymphoma, first described as a distinct clinical entity in 1958<sup>1, 2</sup>. It represents an aggressive, rapidly growing B-cell neoplasm<sup>3</sup>, characterized by a very rapid progression of tumor cell pools and the cell multiplication taking place every 24 hours. A high reproduction of tumor cells and a high tumor growth often lead to a late diagnosis when the tumor is already disseminated, resulting in a higher incidence of recurrence and a lower survival percentage.

Although BL is a rare cause of intussusceptions, it must arouse suspicion if the intussusception occurs outside the characteristic peak (after two years).

## Case report

A previously healthy boy, aged 7, was referred to the Pediatric Surgery Clinic because of a recurrent abdominal pain and the loss of appetite and body weight. Symptoms had begun a few weeks earlier when he was subfebrile and vomited several times. For the next few days he had constipation, persistent vomiting after every meal and was persistently febrile (38°C). On admission, the child was pale and sweaty, with a soft, distended abdomen, sensitive to palpation in the ileocecal region, and had stools without blood.

The patient was anemic and the results of blood count were as follows: leucocytes (Le)  $7.7 \times 10^9/L$ , erythrocytes (Er)  $4.19 \times 10^{12}/L$ , hemoglobin (Hb) 7.4 g/dL, hematocrit 26.7%, platelets (PLT)  $648 \times 10^9/L$ . He was also hypoproteinemic (total protein 54 g/L) due to hypoalbuminemia (albumin 26.3 g/L). Lactate dehydrogenase (LDH) was 825 U/L, with the C-reactive protein values 326 mg/L.

Plain abdominal radiography in the standing position indicated the presence of multiple aero-liquid levels predominantly in the upper and the right parts of the abdomen (Figure 1). Echosonography revealed free fluid in the subhepatic and the right paracolic space accompanied by

some very dilated aperistaltic intestinal convolutions with a “target sign” in the ileocecal region.

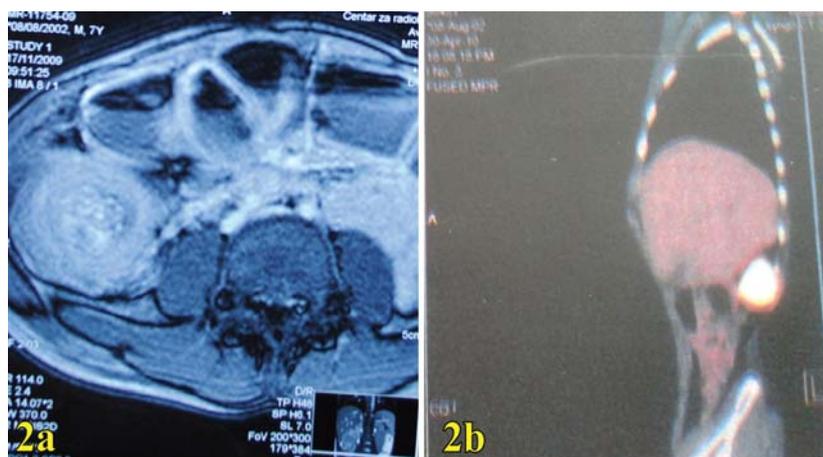
Nuclear magnetic resonance (NMR) examination of the upper abdomen detected colonic stenosis in the distal part of the ascending colon immediately before the hepatic flexure with the maximum luminal diameter of 4 mm, spreading 4.5 cm in length. Stenosis was caused by the characteristic tubular “target sign” (Figure 2a) formation which corresponds to invagination; however, the presence of lymphatic tumor could not be excluded.

Following the stabilization and the corrections of the metabolic status, and the transfusion of washed red blood cells, surgical intervention was performed. The surgical procedure revealed the presence of a solid bloody friable surface tumor in the terminal ileum, located 10 cm from the ileocecal valve, measuring approximately 5 cm in diameter with a firm consistency that occupied almost all of the lumen and invaded the antimesenteric ileal wall. Right hemicolectomy was performed with the termino-terminal ileocolic anastomosis. The boy spent seven days in the intensive care unit receiving dual antibiotic therapy. The histopathology examination of the excised tumor mass proved to be Burkitt lymphoma.

After the recovery, the patient underwent 2 courses of oncologic treatment. Four months after the operation, follow-up ultrasound examination revealed changes measuring  $10 \times 7$  mm in the retroperitoneal space near the lower pole of the right kidney. In the forthcoming period, the mass had the tendency to increase progressively reaching the dimensions of  $36 \times 33$  mm as reported during one of the following examinations conducted 2 months later. Position emission tomography (PET) scan detected a change in standardized uptake values (SUV) of 16.06, which corresponded to metabolically active deposit recurrence of the underlying disease (Figure 2b). After the standard preoperative preparation, the boy was operated on, and the tumor mass was completely enucleated. Histopathology examination of the excised tumor mass confirmed to be relapsed BL. To date, all the performed check-up results were within normal ranges.



**Fig. 1** – Plain radiography of the abdomen with multiple aero-liquid levels in the upper parts and right parts of the abdomen.



**Fig. 2** – a) Nuclear magnetic resonance examination of the upper abdomen detected colonic stenosis in the distal part of the ascending colon immediately before the hepatic flexure with maximum luminal diameter of 4 mm, spreading to the length of 4.5 cm; b) Positron emission tomography scan corresponds to the metabolically active deposit in the retroperitoneal space near the lower pole of the right kidney.

## Discussion

Abdominal pain is a very common surgical problem in pediatric population, caused by a variety of mechanical factors, although metabolic, hormonal, neuromuscular disorders and even malignancy cannot be excluded.

BL is a highly malignant, aggressive, rapidly growing B-cell neoplasm<sup>2</sup>.

During the last 30–40 years, sporadic forms of BL have increasingly spread worldwide manifesting themselves in direct or indirect symptoms all over the digestive tract (causing invagination, constipation, bleeding or mechanical intestinal pressure)<sup>3</sup>.

Ultrasound is an essential diagnostic procedure with a high sensitivity rate (over 98%), that may indicate the existence of a “target sign“ caused by invagination due to occult tumors most commonly appearing in the ileocecal junction<sup>4</sup>.

The prevalence of gastrointestinal BL in childhood is not known with much certainty, as the data on only a few series of patients have been published in the literature. Bethel et al.<sup>5</sup> claimed that BL accounts for less than 1% of all pediatric gastrointestinal malignancies. It is usually localized in the ileocecal region, which is to be expected due to the increased concentration of lymphoid tissue. The colon, stomach and rectum are rarely affected.

The onset of BL in children is often abrupt, with rapid development and progression of neoplasm. BL appears to be the fastest growing human malignancy, with doubling time of 24–48 hours, regardless of the type, with the peak incidence between the ages of 11–14 years and with boys predominance of 3 : 1<sup>6,7</sup>. In BL relapses, the bone marrow is most often involved. Intra-abdominal disease occurs in 20–40% of childhood cases with male predominance, involving predominantly ileum or ileocecal valve<sup>8</sup>.

The most frequent symptom is intestinal obstruction, caused by intussusceptions, which can be acute (complete) or chronic (partial). Our patient had subacute onset of symptoms with the loss of weight, constipation and two out of three typical signs of invagination: vomiting and pain in the ileocecal region.

It is still a subject of debate which diagnostic procedures provide credible information in the diagnosis of intussus-

ceptions caused by BL. Some experts believe<sup>9</sup> that ultrasound as a noninvasive diagnostic tool in the pediatric age has priority, while others believe that computer tomography (CT) and NMR offer a much more visual picture of the abdomen, giving a precise overview of the intestinal wall condition, clearly delineating the tumor. CT provides better information about cancer dissemination in the abdomen.

During PET scan, exposure to radiation is extremely short without affecting the normal processes in the body. Sensitivity of the method is very high, forming three-dimensional pictures used to calculate the body volume and the size of focal lesions. PET is the most effective method in detecting the recurrence of cancer (especially lymphoma and melanoma), detecting a higher tumor-cell metabolic activity *versus* normal rates. PET scanning is also a dominant method for assessing the effectiveness of chemotherapy.

Fortunately, BL is very sensitive to chemotherapy as published by Englund et al.<sup>10</sup>. They also stated that patients with invagination as the initial sign of BL (like in our patient) require a less extensive and shorter course of chemotherapy compared to patients where the symptoms appear progressively later.

In the presented patient, we performed right hemicolectomy (with complete tumor resection) followed by the subsequent termino-terminal ileocolic anastomosis. PET scan was crucial in the diagnosis of retroperitoneal tumor mass confirming recurrence of the underlying disease.

## Conclusion

Although BL is a very rare leading point for the development of intussusceptions, it should always arouse suspicion, especially if the onset of symptoms occurs in older children and preadolescents. In BL patients, the role of surgery is based on complete enucleation of the tumor mass with a “free edge” and the resolution of acute abdomen signs. A complex multidisciplinary approach should be adopted for each patient. The timely diagnosis, high rate tumor sensitivity to chemotherapy and also the great importance of PET scan in early detection of tumor recurrence significantly increase the survival rate in patients with BL.

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