Pyomiositis in children

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**Purpose**

Pyomyositis is a rare infective disease that is characterised by suppuration within striated muscles. In recent years pyomyositis has increasingly been diagnosed even in patients without predisposing factors.

Early diagnosis is critical for saving the tissue and also the life of patient but is often missed because of unfamiliarity with the disease, atypical presentations, a wide range of differential diagnoses, lack of early specific signs.

To evaluate the role of diagnostic techniques in the early diagnosis and therapeutic management of pyomyositis in children.
Methods and Materials

We reviewed the cases of pyomyositis have been presented in the last six years in our hospital.

The clinical findings, laboratory results and diagnostic imaging studies were included in the analysis.

All children had at least one US examination. Both MRI and US were available in 6 children.

The diagnosis of suspected lesions was performed using B-mode ultrasound and color Doppler.

Subsequently, the study is completed with MR imaging by axial, coronal and sagittal T1-weighted sequences, T2-weighted sequences, STIR and diffusion. In all patients gadolinium IV was administered.

Pyomyositis was classified in three stages,

(1) Invasive stage: which causes the muscle to become edematous and painful,

(2) Suppurative stage: is characterized by formation of an abscess.

(3) Late stage: involves systemic spread of the infection, leading to septicemia, multifocal or extensive abscesses, and shock.
**Results**

9 cases of pyomyositis were studied, 5 of which were women and 4 men with ages from 1 to 12 years.

The pyomyositis involved the following parts:
- Abdomen ($n=2$);
- Pelvis ($n=3$);
- Thigh ($n=3$);
- Neck ($n=1$).

These patients had typical clinical symptoms with increasing size, redness, heat, fever, pain, and malfunction of involved extremities. Laboratory test reveal anaemia, leucocytosis (shift to the left), raised erythrocyte sedimentation rate, and acute phase reactant. Staphylococcus aureus was the organism most commonly cultured from the abscess. The muscles of the lower limbs were the most frequently affected.

A history of trauma was described in 3 patients. Immunodeficient states were present in 2 patientes. The other patient had not history of interest.

**US findings:**

Ultrasound was performed in all patients. In 3 patients with pyomyositis in the pelvic region with involvement of the iliacus muscle (FIG 10), gluteus maximus muscle (FIG 3,4,5) and gluteus minimus muscle, the US was not conclusive. Pain in the hip joint was the main presenting symptom and only an US examination of the hip joint was carried out and the pyomyositis was primarily not diagnosed. The hip joint US was normal.

Two US appearances have been showed and correspond to the two stages of the disease. The first stage consists of a phlegmon, which is characterized by localized muscle edema and appears as a nonspecific, hypoechoic, ill-defined area within one or more muscles (FIG 1, 6). Later in the course of the disease, an intramuscular fluid collection corresponding to a formed abscess is seen (FIG. 3, 8, 10), which usually required drainage for complete resolution. Fluid collections were present in 4 cases (FIG 3). Involvement of the overlying subcutaneous tissue was observed in 2 patients (FIG. 3). In 4 patients colour Doppler US was carried out, 2 showing an increased perfusion (FIG 1, 6) and 2 demonstrating only slight perfusión (FIG 8).
RM findings:

Seven children received an MRI scan.

MRI showed hyperintense on T2 weighted images, isointense on T1 images. After contrast material injection, necrotic tissue manifests as a low-signal intensity area surrounded by a hyperintense enhancing rim case (FIG 4, 6, 9, 11). On T2-weighted and short inversion time inversion-recovery (STIR) images, the abscessed collection is hyperintense. Areas of abnormal high signal intensity in adjacent muscles represent unorganized phlegmonous collections, edema, or hiperemia (FIG 1).

On the DWI images the abscessed collection is showed like high signal intensity. On the ADC-map a low signal should be visible in the same area, confirming the presence of diffusion-restriction (FIG 5).

MRI was the imaging modality of choice for pelvis. Fascial involvement was detected in 3 cases (FIG 3, 4). In 3 patients the subcutaneous tissue was involved (FIG 4) and fluid collections were present in 4 children (FIG 4).

In all cases adjacent bones structures were not affected.

The US and MRI follow-up showed regression in all patients (FIG 2, 7).

Treatment of myositis consisted of antibiotics and drainage in case of muscular abscesses. Diffuse pyomyositis without abscess may respond to an antimicrobial agent alone but abscess may develop eventually requiring drainage (FIG 8).
**Fig. 1:** Case 1. Pyomyositis of right sternocleidomastoid at its invasive phase. US shows hypoechoic, ill-defined area within right sternocleidomastoid, without abscess formation, showing an increased perfusion. On STIR images demonstrates areas of abnormal high signal intensity within muscle.

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After two weeks of antibiotic treatment.
Fig. 3: Case 2. One year old girl with high fever, pain and antalgic position of the left leg. US shows pyomyositis of left gluteus maximus muscle at its suppurative phase.

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**Fig. 4:** Case 2. MRI shows hyperintense on T2 weighted images, isointese on T1 images. After contrast material injection, necrotic tissue manifests as a low-signal intensity area surrounded by a hyperintense enhancing rim. On STIR images, the abscessed collection is hyperintense. Fascial involvement was detected and the subcutaneous tissue was affected.

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**Fig. 5:** Case 2. On the diffusion shows high signal intensity and ADC-map a low signal in the same area, confirming the presence of diffusion-restriction. This patient was treated with percutaneous drainage.

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Fig. 6: Case 3. Pyomyositis of left thigh at its invasive phase. US shows localised muscle edema, distortion of the filamentous planes with ill-defined areas of decreased echogenicity and an increased perfusion.

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Fig. 7: Case 3. After two weeks of antibiotic treatment the US follow-up showed regression. There is still an increased perfusion.

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Fig. 8: Case 4. The patient had a history of trauma. US demonstrates the evolution of pyomyositis from invasive phase to suppurative phase of left thigh. US shows slight perfusion. Treatment consisted of antibiotics and drainage of muscular abscess.

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Fig. 9: Case 5. History of trauma. Pyomyositis of the left rectus abdominis muscle at its suppurative phase, with abscess formation. MRI shows small abscesses within left rectus abdominis muscle.

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Fig. 10: Case 6. Seven years old boy with anaemia, acute phase reactant, fever and pain of legs. Pyomyositis of bilateral iliac at its suppurative phase, with abscess formation. Axial and coronal CT image shows enlargement and mild hypoattenuation of the bilateral iliacus muscle with intramuscular fluid collections, larger on the left side.

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Fig. 11: Case 6. MRI image of the same patient shows enlargement and fluid collections in bilateral iliacus muscles.

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Conclusion

The pyomyositis is a rare pathologic condition in children and early diagnosis is difficult. Because clinical and laboratory parameters present low diagnostic sensitivity and specificity for the detection of musculoskeletal infection, radiology plays an essential role in the early diagnosis, also allowing detection of the anatomical compartment involved by the infection and thereby helping to guide treatment options.

Any muscle group can be affected although the most frequently involved muscles are the following by order of frequency: quadriceps > gluteus and iliopsoas muscles > upper extremity muscles.

Patients are often otherwise healthy, but may have a history of trauma or immunosuppression. We found history of trauma in 3 patients and history of immunosuppression in 2 patients.

The pyomyositis classification is useful in the clinical and radiological correlation.

Ultrasound is very useful for the early diagnosis of the pyomiositis. MRI confirms the diagnosis, evaluate the local extension and allows to despicte bone affection. Ultrasound is the fastest option available for us, used for initial diagnosis, monitoring and guide to drainage if it is necessary.
References