PYOMYOSITIS-WITH SPECIAL REFERENCE TO THE COMPARISON BETWEEN EXTRA- AND INTRAPELVIC MUSCLE ABSCESS

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Abstract. Fifteen patients, nine males and six females, diagnosed with pyomyositis from 1988 to 1994, and followed for an average of 69.8 months, were reviewed. Excluding two children, the average age was 56.6 years. Eleven adults (73.3 %) had underlying diseases. The lesions were multiple in five patients (33.3 %) and a total of twenty-four muscle abscesses, including eleven extrapelvic and thirteen intrapelvic, were identified. When comparing extra- and intrapelvic pyomyositis, intrapelvic pyomyositis presents a diagnostic challenge requiring a high index of suspicion. Distinct clinical features such as local heat and painful swelling were all identified in extrapelvic pyomyositis, but they rarely (in only two of the thirteen lesions) emerged in intrapelvic pyomyositis. The average time from presentation to diagnosis was significantly longer in intrapelvic than in extrapelvic pyomyositis (1.4 *vs* 9.7 days). Although aspiration showed a high diagnostic rate in extrapelvic muscle abscesses, it was difficult to perform and was occasionally misinterpreted in intrapelvic cases. Routine X-rays were not helpful in making the diagnosis. CT scan was valuable because it provided positive diagnostic findings in all twelve patients who received one. The causative organisms in our patients were *Staphylococcus aureus* in eight (53.3 %), *Escherichia* coli in three (20 %), and *Klebsiella* in three (20 %). Treatments consisted of parenteral antibiotics for all patients, image-guided aspiration in four patients, and surgical drainage in eleven patients. Two intrapelvic pyomyositis patients expired due to sepsis. At the completion of the study, twelve patients were asymptomtic without sequel, and one patient had a recurrence.

INTRODUCTION

Pyomyositis is an acute bacterial infection of skeletal muscles resulting in abscess formation. Due to early reports predominantly from tropical countries, the infection is frequently referred to as "tropical myositis, tropical pyomyositis, or myositis tropicans." It is a common entity in tropical climates (Horn and Master, 1968; Chiedozi, 1979), and remains unusual in temperate zones (Renwick and Ritterbusch, 1993; Christin and Sarosi, 1992). Pyomyositis may occur in any muscle. Abscess in superficial muscle groups, including the thigh, buttock, and shoulder, always manifests itself as a hot, painful swelling; thus, a computed tomography (CT) scan or subsequent aspiration may establish the definitive diagnosis without difficulty. However, in cases where the lesions are deep-seated, such as in intrapelvic pyomyositis, the infection may present systemic septic manifestations and muscle pain without obvious infectious signs on overlying skin. This can lead to delay and confusion in diagnosis. We attempted to address this issue, and reviewed the clinical presentations, diagnostic processes, and treatment outcomes in our pyomyositis patients.

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MATERIALS AND METHODS

A review of the medical records of all patients treated at the authors' institute from 1988 to 1994 was performed to identify those cases diagnosed with pyomyositis. Twenty-two patients had documented pyomyositis. All these cases were proven surgically or by direct aspiration. Among the twenty-two patients, six cases of diskitis or infectious spondylitis with contiguous psoas pyomyositis, and one patient with a deep neck infection, were excluded because the primary infectious foci were not in the muscle, leaving fifteen patients (nine males and six females) for review (Table 1). The average age at diagnosis of the fifteen patients was 49.2 years (range: 2 to 70 years); excluding two children, the average age was 55.7 years. Of the fifteen

Table 1

Summary of clinical presentation, treatment course, and follow up of patients with pyomyositis.

Patient data				Clinical presentation						Treatment[5]	Follow-up data	
Case	Sex/ age (yrs)	Trauma	Underlying condition[1]	Diagnosis duration (days)	Initial symptoms[2] Systemic	Local	Sites[3]	Pus culture[4]	Blood culture[4]		Duration (months)	Follow-up findings[6]
1	M/2	-	-	1	F+	+	Quad	S.aureus	ND	I/D	82	Asympt
2	M/58	-	DM DM neuropathy Ischemia leg s/p	2	F-	+	Quad	S.aureus	NG	I/D	58	Asympt
3	F/57	-	DM, Adr Insuf	1	F-	+	Quad	K.oxy	NG	I/D	82	R sep k
4	F/40	+	Adenocarcinoma	2	F+	+	GlMax	S.aureus	S.aureus	Aspiration	44	Asympt
5	M/48	+	DM	2	F+	+	Deltoid	NG	NG	I/D	85	Asympt
6	M/50	-	DM	1	F+	+	Deltoid	K.p	K.p	I/D	70	Asympt
7	M/12	-	-	2	F+	+	SCM	S.aureus	ND	I/D	95	Asympt
8	M/65	-	-	2	F-	+	SCM	S.aureus	S.aureus	I/D	82	Asympt
9	F/70	-	DM, RA, Adr insuf	1 (Quad) 14 (Psoas)	F-	+ - -	Quad Iliacus Psoas	E.coli	NG	Thigh: I/D Psoas: failed Aspiration	-	Exp d a
10	M/65	-	DM, H/T, CVD	1	F+ sepsis	-	Psoas	E.coli	E.coli	I/D	98	Asympt
11	F/66	-	DM Cervical CA	40	F+	-	Psoas	K.p	K.p	Percutaneous drainage	72	Asympt
12	F/56	-	DM Old fem neck fx	1	F+ sepsis	+ + - +	Quad Gl max Iliacus Psoas	E.coli	NG	Thigh: I/D Psoas: failed Aspiration	-	Exp d a
13	M/33	-	Liver cirrhosis Old fem neck fx	7	F-	- -	Iliacus Psoas	S.aureus	NG	Wrong Arthrotomy I/D	38	Asympt
14	F/66	+	Adr insuf	7	F+	+ - -	Psoas Iliacus Obt ext (septic hip)	S.aureus	S.aureus	I/D + Hip Arthrotomy	46	Asympt
15	M/50	-	-	10	F-	- -	Iliacus Psoas	S.aureus	NG	I/D	35	Asympt

[1]Underlying condition refers to any circumstance (disease, treatment) that may have predisposed the patient to pyomyositis. DM = diabetes mellitus; Adr Insuf = iatrogenic adrenal insufficiency; H/T = hypertension; CVD = cerebral vascular disease; RA = rheumatoid arthritis; cervical CA = cervical carcinoma.

[2]Initial symptom refers to the major clinical presentations. F+ = temperature over 37.8°C; F- = no fever; local symptoms = with different muscle abscess in the next column, including localized heat, swelling, redness, or induration.

[3]Sites refers to the involved muscle(s) identified by ultrasound or CT scan studies. Quad = Quadriceps; Gl max = Gluteal maximus; Obt ext = Obturator externus; SCM = sternocleidomastoid.

[4]Pus/Blood culture: S.aureus = Staphylococcus aureus; K.oxy = Klebsiella oxytoca; K.p = Klebsiella pneumoniae; E.coli = Escherichia coli; NG = no growth; ND = not done.

[5]Treatment: I/D = surgical incision drainage.

[6] Follow-up findings: Asympt= Asymptomatic; R sep k = Recurrent septic knee; Exp da = Expired during admission.

patients, two with intrapelvic pyomyositis expired during admission due to sepsis. The length of clinical follow-up of the remaining thirteen patients ranged from 38 to 98 months (mean: 69.8 months).

RESULTS

Of the fifteen patients in the study, eleven (73.3 %) had histories of systemic diseases, including diabetes mellitus, cerebral vascular disease, hypertension, rheumatoid arthritis, malignancy, and iatrogenic adrenal insufficiency syndrome. Three patients (20 %) had a history of trauma, and two patients had been incapable of walking without crutches for over one year due to hip lesions (ipsilateral to their pyomyositis).

Five patients (33.3 %; cases 9, 12, 13, 14, and 15) had multiple lesions in different muscles; a total of twenty-four lesions were identified in this study. There were eleven extrapelvic muscle abscesses (5 in quadriceps, 2 each in deltoid, gluteal, and sternocleidomastoid), and thirteen intrapelvic muscle abscesses (7 in psoas, 5 in iliacus, and 1 in obturator externus). In addition to pyomyositis, four patients (26.6 %) had other concomitant infections, including pneumonia in two, a liver abscess in one, and a urinary infection and ipsilateral hip pyoarthrosis in one.

Usually the patients had initial complaints of insidious pain in the involved muscle groups. Nine patients (60 %) exhibited fever, and two patients (13.3 %) presented sepsis at the time of admission. Local heat, painful swelling, and inflammatory change on the overlying skin were present in all eleven extrapelvic lesions, but were present in only two of the thirteen intrapelvic lesions. Those without obviously local manifestations presented vague symptoms ranging from cramping and worsening muscle or joint pain to septic shock.

The mean time from presentation to diagnosis was 5.9 days (range: 1 to 40 days) for all patients, and 1.4 days and 9.7 days for extrapelvic and intrapelvic pyomyositis, respectively. The time interval was significantly shorter in extrapelvic than in intrapelvic lesions ($p < 0.05$).

Laboratory studies at the time of admission included count and differentiation of leukocytes, erythrocyte sedimentation rate (ESR), blood cultures, and pus taken from aspiration or surgical drainage. The leukocyte count as well as the ESR was elevated in all patients. A blood culture was performed on thirteen patients, and six were positive. Aspiration, done on twelve patients, was successful in eight, but it gave false results in four cases of intrapelvic pyomyositis, including two false-negatives of pyomyositis (cases 9 and 12), one false-positive of septic hip (case 13), and one true-positive of septic hip with a false-negative of pyomyositis (case 14). Conclusively, the pus cultures from aspiration or surgical drainage were positive in fourteen patients (93.3 %), with *Staphylococcus aureus* in eight (53.3 %), *Escherichia coli* in three (20 %), and *Klebsiella* in three (20 %).

Plain X-ray films of the involved areas were taken for all patients; however, no specific finding was observed. Radionuclide bone scans were performed on five patients and all were negative; gallium scans on five patients identified four as positive. Twelve patients had CT scans and three had ultrasound, which showed intramuscular abscess in all patients.

All our patients were treated with a parenteral antibiotic after the routine examinations and cultures. The initial antibiotic was generally first generation cephalosporin, or two combined regimen in those patients with systemic sepsis or who were immunocompromised. We changed the antibiotic when culture results were available. Most of the eleven patients who underwent surgical incision and drainage responded well after the surgery, and the course of recovery was relatively benign. The remaining four underwent repeated aspirations because of their inability to tolerate anesthesia and surgery. Two patients recovered (cases 4 and 11), and two cases of intrapelvic pyomyositis (cases 9 and 12) expired due to complications of sepsis. Follow-up of the remaining thirteen patients showed recurrent abscess and infection of the contiguous knee joint in one case of quadriceps pyomyositis (case 3). Parenteral antibiotics, extensive debridement, and knee arthrodesis resolved the recurrence in this patient. The other twelve patients were asymptomatic without sequel.

DISCUSSION

Pyomyositis may occur in any muscle group. Its clinical features and prognosis vary according to its

location. In this study, we observed striking differences between intra- and extrapelvic pyomyositis. Extrapelvic pyomyositis always presented itself with distinct local inflammatory signs, so early diagnosis was easy. On the contrary, intrapelvic pyomyositis presented a diagnostic challenge. It usually (in 11 of 13 lesions) displayed vague symptoms. A high index of suspicion and appropriate employment of imaging modalities are mandatory for early and accurate diagnosis. In addition, the rate of successful aspiration was relatively low for intrapelvic pyomyositis. Finally, the average time interval from presentation to diagnosis was significantly longer for intrapelvic pyomyositis (9.7 days) than for extrapelvic pyomyositis (1.4 days).

Needle aspiration was considered a good tool in diagnosing pyomyositis. A previous study showed a more than 80% positive aspiration rate (Chiedozi, 1979). However, most of the lesions involved quadriceps, gluteal, and deltoid muscles, all of which belong to superficial muscle groups. In our series, aspiration accurately established the diagnosis of pyomyositis in extrapelvic lesions, but gave false results in four of five intrapelvic pyomyositis patients. In intrapelvic pyomyositis, most patients presented tenderness without palpable mass or visible swelling; therefore, aspiration may not be so easy, even under the guide of a CT scan (Zych and McCollough, 1985). Moreover, due to the similarity of the clinical symptoms of septic hip arthritis and adjacent intrapelvic pyomyositis, hip arthrocentesis or aspiration around the hip led to a problem in differentiating the source of infection (Andrew and Czyz, 1988). One case of pyomyositis located in both the iliacus and psoas muscles, and showing a false-positive hip arthrocentesis from the muscle abscess (case 13), was misdiagnosed as septic hip arthritis, and symptoms persisted after negative hip arthrotomy. A subsequent CT scan demonstrated the abscess in the muscles and urged a second surgery to resolve the infection (Fig 1A, 1B). Another case of synchronous psoas, iliacus, and obturator externus pyomyositis plus septic hip arthritis with a positive hip arthrocentesis (case 14) was misdiagnosed as septic hip and the pyomyositis was missed initially. Fortunately, a CT scan before arthrotomy demonstrated the concomitant lesions (Fig 2). Subsequently, the patient underwent arthrotomy and simultaneous incisional drainage of muscle abscesses without further morbidity. Therefore, in the presence of a positive hip arthrocentesis, special attention should be given to the possibility of concomitant intrapelvic pyomyositis. Aspiration with fluoroscopy may be recommended, as fluoroscopy can provide the anatomical location where the aspiration is needed, and help to differentiate between intra- and extra-articular lesions (March *et al*, 1942; Zych and McCollough, 1985).

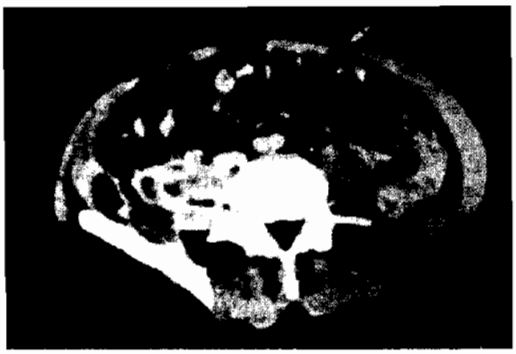

Fig 1A–Computed tomographic scan showing an abscess of the right iliopsoas muscle in the pelvis.

Fig 1B–There is no more pus accumulation in the right iliopsoas muscle after surgical drainage and parenteral treatment.

With regard to imaging modalities, plain radiography was not helpful in diagnosing pyomyositis. Along with nuclear medicine studies, five patients

had radionuclide bone and gallium scans in this study. The main purpose of the bone scan was to exclude bony lesions, such as osteomyelitis. Four of the five gallium scans had positive findings. This supported previous reports on the value of the gallium scan (Grose, 1987; Chiu *et al,* 1997). The definitive diagnosis of pyomyositis in this series was usually aided by the findings of ultrasound and a CT scan. Three of our fifteen patients had ultrasound, and twelve had CT scans; they were all diagnostic. In addition, in one of our patients (case 14), CT scans with an intravenous contrast medium detected his concomitant hip joint effusion as well as his psoas, iliacus, and obturator externus pyomyositis (Fig 2), all of which were confirmed by pathology and cultures. Although MRI has been considered to be the most sensitive means of identifying pyomyositis and differentiating other pathologic conditions (Yuh *et al,* 1988), previous reports have also verified that a CT scan is effective in diagnosing pyomyositis. Renwick and Ritterbusch concluded that a CT scan is as efficacious in diagnosing pyomyositis as MRI, but insufficient in the definition of joints; therefore they emphasized the use of ultrasound, in addition to a CT scan, to evaluate joint space (Renwick and Ritterbusch, 1993). However, they did not mention whether their CT scans were done with or without intravenous contrast. In our cases, CT scans with contrast gave good definition of the joint space and were reliable in detecting simultaneous infection of joints.

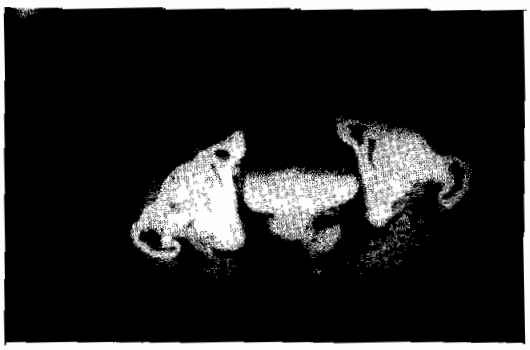

Fig 2–Computed tomography with intravenous contrast medium of case 14 demonstrated marked inflammatory change with effusion in the right hip joint and abscess in the right iliacus, psoas, and obturator externus muscles.

Although several microorganisms are encountered in pyomyositis, *Staphylococcus aureus* is still the major responsible organism both in children and adults, and in tropical as well as temperate areas (Chacha, 1970; Chiedozi, 1979). However, according to recent reports, the incidence of non-staphylococcus-caused pyomyositis has increased (Sarubbi *et al,* 1989; Fincheer *et al,* 1990; Widrow *et al,* 1991; Beavers, 1992). Widrow *et al* (1991) suggested that abnormality of the neutrophil function in HIV-seropositive patients rendered them susceptible to gram-negative, catalase-producing organisms other than *Staphylococcus* (Widrow *et al,* 1991). In our patients, the causative organism was *Staphylococcus.* In eight (53.3 %) and gram-negative bacteria in six (40 %). All six patients infected by the unusual gram-negative bacteria were diabetic. In light of the diabetic patient often being considered an immuno-compromised host (Rayfield *et al,* 1982), our findings of such frequent occurrences with gram-negative bacteria suggest that this is a diabetes-related, defective defense mechanism.

All our patients were treated with parenteral antibiotics initially. Eleven patients underwent surgical incision and drainage soon after localization of the lesions. At the completion of this study, almost all the patients were asymptomatic, except for one showing recurrence six months after the initial pyomyositis. This result correlates well with most reports which concluded that early surgical debridement of pyomyositis, even with extensive involvement, always results in rapid resolution without sequel. Nevertheless, the reported mortality rates of pyomyositis ranged from 0.89 to 10% (Anand and Evans, 1964; Chacha, 1970; Levin *et al,* 1971). Some studies showed a higher mortality in patients with streptococcal pyomyositis, and the overall mortality described by Adams *et al* (1985) was eighteen of twenty-one patients with streptococcal pyomyositis (Widrow *et al,* 1991). Also, Widrow *et al* (1991) described high recurrence and multiple muscle group involvement in six HIV-seropositive patients with pyomyositis. Abnormalities of neutrophil and immunoglobulin are thought to be the cause. Prolonged antimicrobial-therapy and repeated drainage therapy are therefore recommended for HIV-seropositive patients (Adams *et al,* 1985). In this study, we believe that three potential factors should be considered in the two

mortality cases of intrapelvic pyomyositis: 1) delay in diagnosis, 2) an unusual gram-negative causative organism, and 3) defective host immunity from an underlying disease.

In conclusion, pyomyositis, especially intrapelvic pyomyositis, should always be considered in the differential diagnosis of septic-appearing patients with myalgias or arthralgia, even though there are no obvious local findings. Diagnosis by aspiration in intrapelvic pyomyositis often causes misinterpretation, and an image study may be necessary before surgery. This report also reflects the increasing incidence of gram-negative pyomyositis, which may be associated with a defective defense mechanism in the host.

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