OPEN DRAINAGE VERSUS PERCUTANEOUS DRAINAGE IN THE TREATMENT OF TROPICAL PYOMYOSITIS. PROSPECTIVE AND RANDOMIZED STUDY

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ABSTRACT

Objective: To compare the results from treating tropical pyomyositis through percutaneous drainage of abscesses versus open surgical drainage of abscesses, by means of a randomized prospective study. Methods: Twenty-five patients with tropical pyomyositis (Chiedozi grade II) were included in this study. They were randomized into two groups: group A (n = 13), treated with antibiotics and open drainage of the abscesses; and group B (n = 12), treated with antibiotics and percutaneous drainage of the abscesses. Results: The mean age was 35.3 years (± 19.2) in group A and 30.1 years (± 9) in group B (p = 0.41). There were eight female patients (61.5%) and five male patients (38.5%) in group A; in group B, three were female (25%) and nine were male (75%) (p = 0.11). Staphylococcus aureus was the microorganism most frequently found (72%). The mean hospital stay in group A was 12.7 days (± 2.3), and in group B, 10.6 days (± 1.6) (p = 0.01). The mean duration of antibiotic use in group A was 12.2 days (± 2.3), and in group B, 10.1 days (± 1.5) (p = 0.02). Conclusion: Percutaneous drainage of the abscesses, in association with antibiotic therapy, is an efficient treatment method for tropical pyomyositis grade II, with shorter antibiotic use and hospital stay for patients.

Keywords – *Pyomyositis; Myositis; Staphylococcus aureus; Abscess*

INTRODUCTION

Tropical pyomyositis, also known as primary pyomyositis, infectious myositis, pyogenic myositis, suppurative myositis or bacterial myositis[1], is an illness with high incidence in countries with a tropical climate. However, it is increasingly reported in countries with a temperate climate[2-13]. In more than 90% of the cases, it is caused by *Staphylococcus aureus*[2-20]. This illness has received little attention in the specialized literature, particularly the orthopedic literature, even in the light of the severe sequelae described in the few reports available in the existing literature and databases. When these sequelae are not treated immediately and appropriately, they often culminate in serious complications for patients, such as muscle necrosis, compartment syndrome, cerebral abscesses, kidney failure, septicemia and death[6,8-10,12,13,15,16,21].

It can affect individuals in any age group, with a slight predominance in the second and third decades of life[2-23]. The initial nonspecific nature of the symptoms, such as fever, pain and slight hardening of the muscle affected, as described by Chiedozi[5], along with the little evidence that any infectious process is becoming established, leads not infrequently to delayed or erroneous diagnosis.

Diagnosing tropical pyomyositis is essentially clinical. Examinations like ultrasound, computed tomography scans and magnetic resonance imaging have their place, especially when the musculature affected is in deep

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We declare that there is no conflict of interests in this article

layers, or when the aim is to define possible differential diagnoses. However, absence of any of these examinations cannot impede or delay the diagnosis and start of treatment, even if administered empirically[1-24].

The treatment proposed for tropical pyomyositis takes into account the effectiveness of treatment with antibiotics alone, when it is in its initial stage, while when it is diagnosed later on, it consists of open drainage of the abscesses, together with broad antibiotic coverage.

The aim of this study was to compare the results from treating tropical pyomyositis through antibiotic therapy and percutaneous drainage of the abscesses versus conventional therapy using antibiotics and open surgical drainage of the abscesses, by means of a randomized prospective study.

METHODS

The study protocol was approved by the Ethics Committee for Research Involving Human Beings, under approval no. 499/04. All the patients, or the adults legally responsible for them, agreed to participate in the study through signing a free and informed consent statement, after having been given detailed information about the content and form of the study.

The sample size was determined prior to the start of the study, by means of specific statistical tests, taking into consideration the α risk (5%) and β risk (20%), along with the variability of the parameters. From this, it was determined that there should be a minimum of 12 individuals per group.

Thirty-one patients with a diagnosis of tropical pyomyositis were initially selected. These patients were admitted to the Orthopedics and Traumatology Service of the Regional Hospital of Coari, Amazonas (HRC) and to the Department of Orthopedics and Traumatology of Marília School of Medicine (Famema), Marília, São Paulo, between February 2004 and February 2008. The inclusion criteria were that the patients should be at least 10 years of age and present tropical pyomyositis in Chiedozi stage II. Patients who were using antibiotics or any medication with action or side effects on the immunological system, or had been using them within the preceding 90 days, were excluded. Six patients were excluded from this study: one who was using benzathine penicillin because of a condition of erysipelas in the legs; one, of indigenous origin, who chose not to follow the proposed treatment; and four patients who were classified as presenting Chiedozi stage I. IN this way, 25 patients in total were included. After receiving an initial diagnosis of tropical pyomyositis, all the patients underwent complementary ultrasound, hemogram, blood culture and erythrocyte sedimentation rate examinations. Some patients underwent magnetic resonance imaging, only for case documentation purposes. After the initial examinations, the patients were randomized into two groups, by means of the method of drawing opaque sealed envelopes. Group A (n = 13) was treated with an antibiotic (oxacillin, intravenously, 8 g/day)[25] and open surgical drainage of the abscesses; while group B (n = 12) was treated with an antibiotic (oxacillin, intravenously, 8 g/day) and percutaneous drainage of the abscesses. All the patients were operated by the same surgical team within a maximum of 24 hours after the start of antibiotic therapy, always under the same pre and postoperative conditions (Figures 1 to 9).

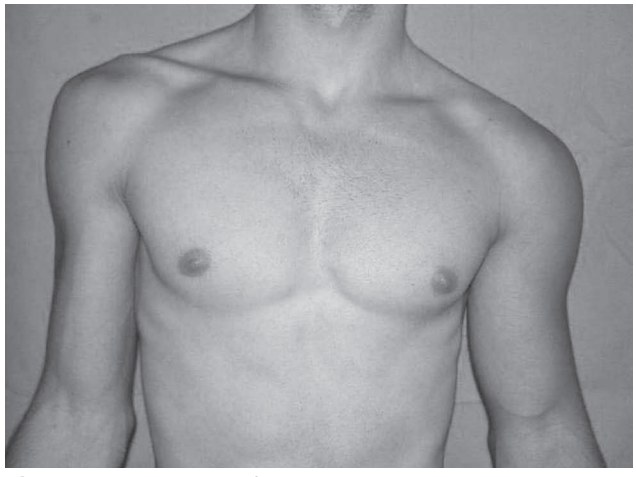

Figure 1 – Frontal view of patient with tropical pyomyositis in the left deltoid muscle

The anesthetic procedure used was a regional blockade, spinal anesthesia or general anesthesia, depending on the musculature involved. The patients in group A underwent asepsis using degerming polyvinylpyrrolidone-iodine and antisepsis using polyvinylpyrrolidone-iodine tincture, and sterile fields were set up. These patients then underwent incisions through all the surgical layers until the abscesses were opened up and drained. Extensive cleaning and irrigation of the open area was performed using 0.9% physiological serum. No drains were used in either of the groups. After the abscesses had been cleaned, the muscle layers were brought together and suturing of the subcutaneous cellular layer was performed using absorbable Vicryl* 2-0 thread (Ethicon®). The skin was sutured using Mononylon* 4-0 thread

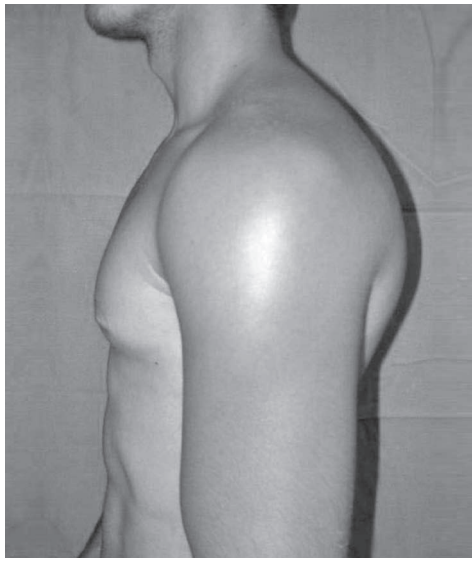

Figure 2 – Lateral view of patient with tropical pyomyositis in the left deltoid muscle

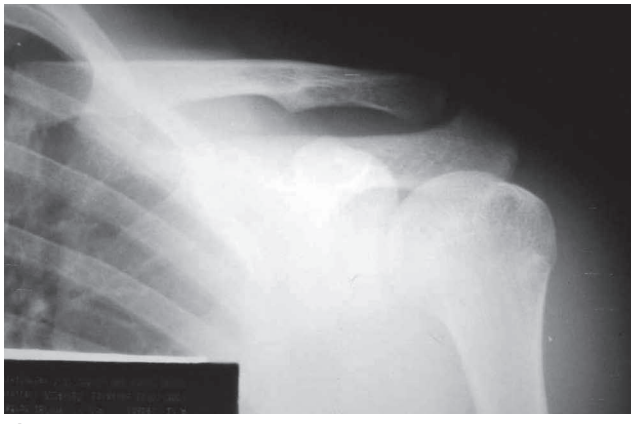

Figure 3 – Anteroposterior radiograph on patient with tropical pyomyositis in the left deltoid muscle, showing increased size of soft tissue

(Ethicon®). The dressings were open and were changed daily until the seventh postoperative day. From then on, the dressings were left open until the 14th postoperative day, when the stitches were removed.

The patients in group B underwent the same anesthesia, asepsis and antisepsis procedures and then had their abscesses aspirated percutaneously, using a Jelco® no. 14 catheter, which was guided by ultrasonography (Logiq 9®, GE Healthcare). The ultrasound transducers were previously covered with sterile plastic bags throughout their extent. After drainage of the entire infectious area and applying occlusive dressings, no type of suturing was performed. As a standard procedure, for all patients, the venous catheters were replaced every 48 hours.

The duration of the antibiotic therapy and the patients' release from hospital was conditional on their satisfactory evolution from a clinical point of view (absence of fever, pain, edema, hyperemia and local flushing) and in relation to laboratory tests (erythrocyte sedimentation rate VHS $\leq$ 20 mm/h; blood culture: negative; hemogram: absence of leukocytosis or left shift).

Figure 4 – Lateral radiograph on the left shoulder of a patient with tropical pyomyositis in the left deltoid muscle

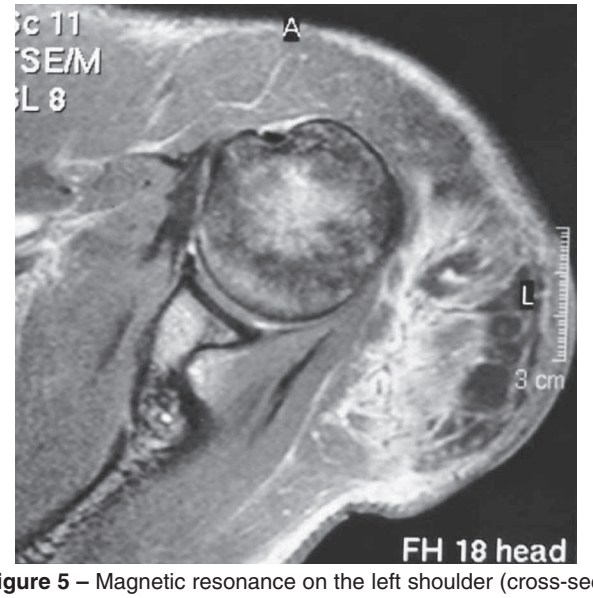

Figure 5 – Magnetic resonance on the left shoulder (cross-sectional), showing great infiltration into the deltoid muscle

STATISTICAL METHODOLOGY

The variables of age, sex, type of microorganism, musculature involved, length of hospital stay and du-

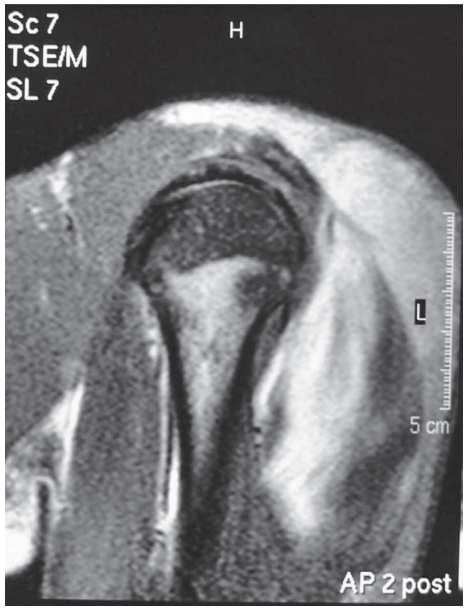

Figure 6 – Magnetic resonance on the left shoulder (coronal section) of a patient with tropical pyomyositis in the left deltoid muscle

Figure 9 – View of a patient with tropical pyomyositis in the left biceps muscle, with extensive edema and hemorrhagic suffusions

Figure 7 – Posterior view of the forearm of a patient with tropical pyomyositis in the extensor musculature

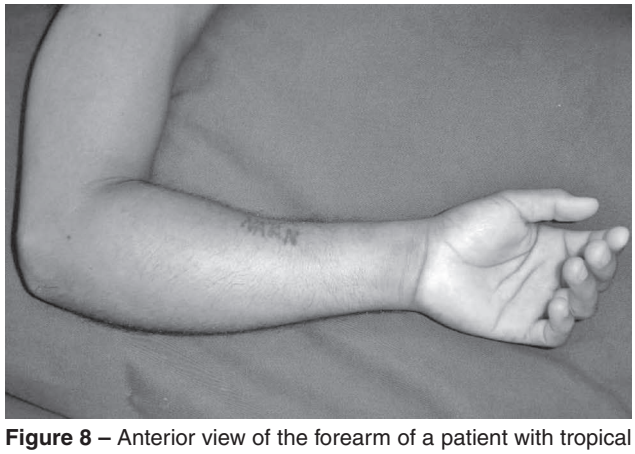

Figure 8 – Anterior view of the forearm of a patient with tropical pyomyositis in the extensor musculature

ration of antibiotic therapy were analyzed by means of parametric or nonparametric descriptive statistical tests in a fully randomized model. For this, the SigmaStat® version 3.5 (Systat Software Inc., 2006) and Minitab® version 15 (Minitab Inc., 2007) software was used. Means, standard deviations, medians, frequencies, percentages and 95% confidence intervals (CI) ($\alpha = 5\%$) were calculated. The statistical power for all tests was set as 80% ($\beta = 20\%$) and differences with $p \leq 0.05$ were taken to be significant.

RESULTS

The mean ages in groups A and B were compared by means of Student's t test. For group A, the mean was 35.3 ± 19.2 years (median: 31 years; 95% CI: 24.8 – 45.8 years), and for group B, it was 30.1 ± 9 years (median: 29 years; 95% CI: 25 – 35.2 years), with $p = 0.41$ (Figure 10).

In group A, eight patients were female (61.5%) and five were male (38.5%); in group B, three were female (25%) and nine were male (75%). From Fisher's exact test, the difference between the frequencies of the sexes in the two groups was considered to be non-significant ($p = 0.11$) (Table 1).

With regard to the etiological agent, the most frequent in group A were *Staphylococcus aureus* in 10 cases (77%), *Streptococcus* in one case (7.7%) and uni-

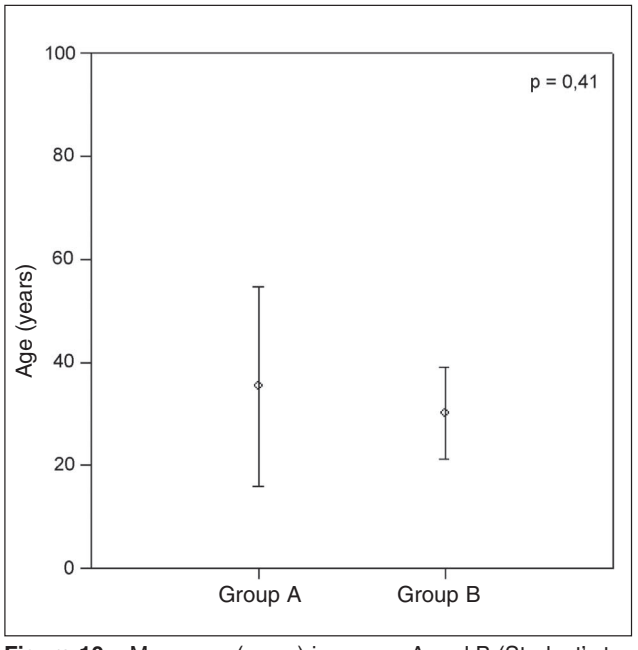

Figure 10 – Mean age (years) in groups A and B (Student's t test, $p = 0.41$)

dentified in two cases (15.3%). Through the Z test for proportions, it was seen that there was a significant difference between the frequencies of the microorganisms found ($p = 0.004$) (Figure 11). In group B, the findings were *Staphylococcus aureus* in eight cases (66.7%), unidentified in three cases (25%) and *Enterococcus* in one case (8.3%). Through the Z test for proportions, it was seen that there was a significant difference between the frequencies of the microorganisms found ($p = 0.04$) (Figure 12).

In group A, the muscles most affected were the latissimus dorsi in three cases (23%), finger and carpal extensors in three cases (23%), gluteus maximus in two cases (15.4%), trapezius in two cases (15.4%), deltoid in one case (7.7%), biceps in one case (7.7%) and quadriceps in one case (7.7%). From applying the Z test for proportions, it was seen that there were no significant differences between the frequencies of the muscles affected ($p = 0.85$). In group B, the muscles most affected were the deltoid in three cases (25%), quadriceps in three cases (25%), finger and carpal extensors in one case (16.7%), anterior tibial in two cases (16.6%), latissimus dorsi in one case (8.3%), gastrocnemius in one case (8.3%) and finger and carpal flexors in one case (8.3%). From applying the Z test for proportions, it was seen that there were no significant differences between the frequencies of the muscles affected ($p = 0.78$).

Table 1 – Fisher's exact test between the frequencies of the sexes in groups A and B ($p = 0.11$)

	Group A	Group B	Total
Female	8	3	11
Male	5	9	14
Total	13	12	25

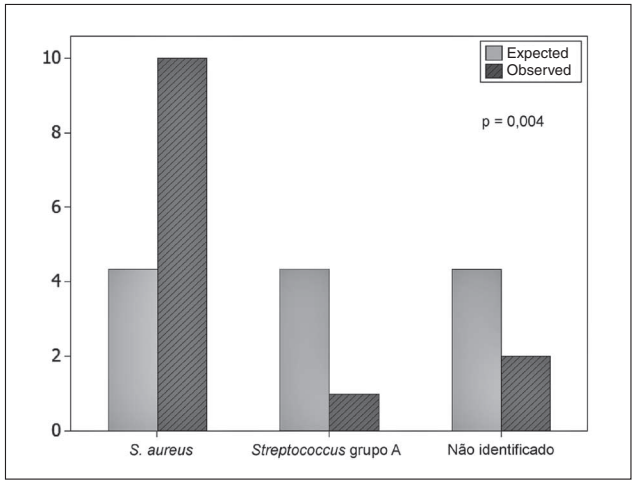

Figure 11 – Frequencies of the microorganisms found in group A (Z test for proportions, $p = 0.004$)

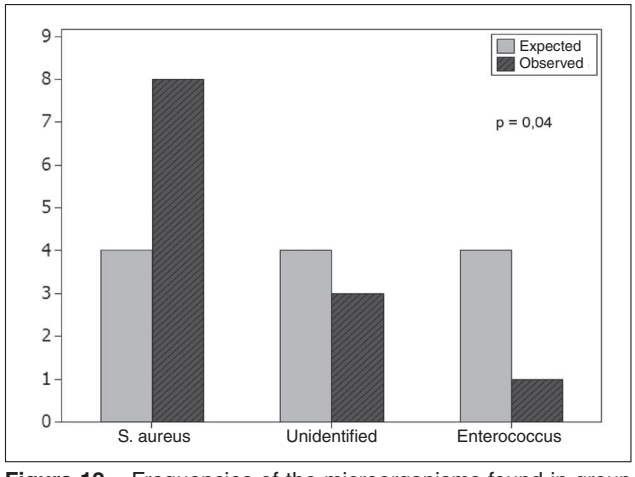

Figure 12 – Frequencies of the microorganisms found in group B (Z test for proportions, $p = 0.04$)

The mean duration of antibiotic use in groups A and B was compared by means of Student's t test. For group A, the mean was 12.2 ± 2.3 days (median: 12 days; 95% CI: 24.8 – 45.8 days), and for group B, it was 10.1 ± 1.5 days (median: 10 days; 95% CI: 25 – 35.2 days), with $p = 0.02$ (Figure 13).

In comparing ages and duration of antibiotic therapy in group A, Spearman's correlation test showed

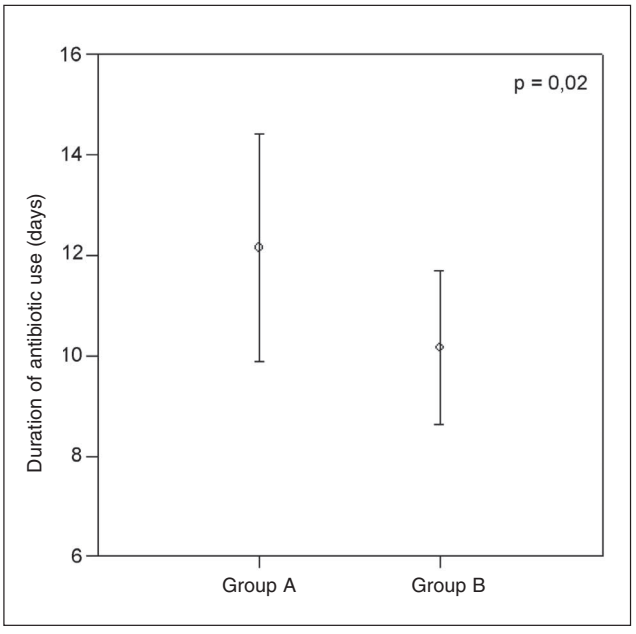

Figure 13 – Mean duration of antibiotic use (days) in groups A and B (Student's t test, $p = 0.02$)

that there was no significant relationship between these variables ($p = 0.64$; r = 0.14) (Figure 14). In group B too, Spearman's correlation test showed that there was no relationship between these variables ($p = 0.78$; r = –0.08) (Figure 15).

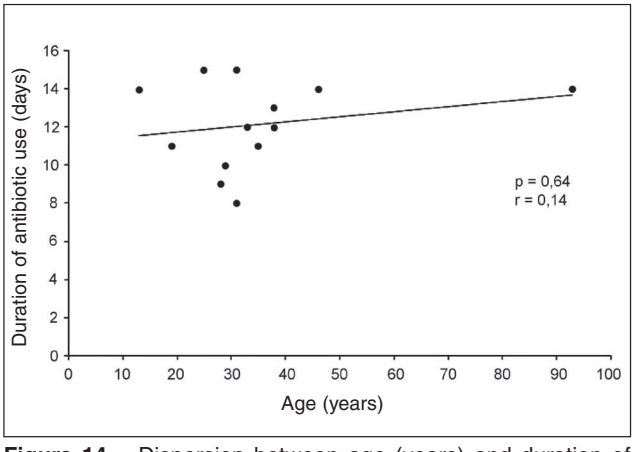

Figure 14 – Dispersion between age (years) and duration of antibiotic use among patients in group A (Spearman's correlation test, $p = 0.64$, r = 0.14)

In comparing the mean duration of antibiotic use between the sexes in the two groups, it was found that in group A, the mean duration among females was 12.1 ± 2.3 days (median: 12.5 days; 95% CI: 10.5 – 13.8 days), and among males, it was 12.2 ± 2.4 days (median: 12

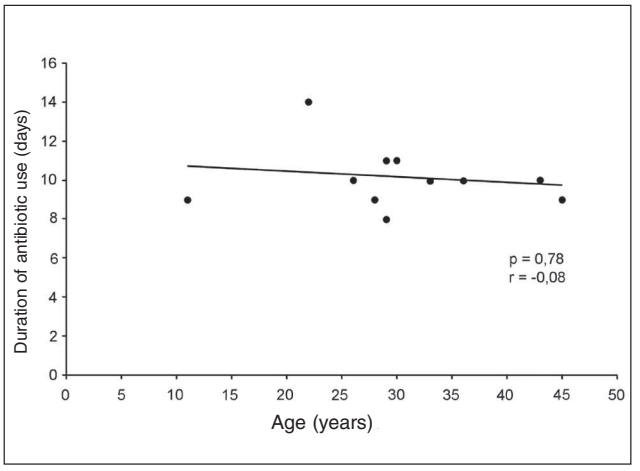

Figure 15 – Dispersion between age (years) and duration of antibiotic use among patients in group B (Spearman's correlation test, $p = 0.78$, r = –0.08)

days; 95% CI: 10.1 – 14.3 days). In group B, the mean duration among females was 10 ± 1 days (median: 10 days; 95% CI: 8.9 – 11.1 days), and among males, it was 10.2 ± 1.7 days (median: 10 days; 95% CI: 9.1 – 11.3 days). Through the multiple analysis of variance test (Anova), it was seen that there was no significant difference between the groups ($p = 0.15$) (Figure 16).

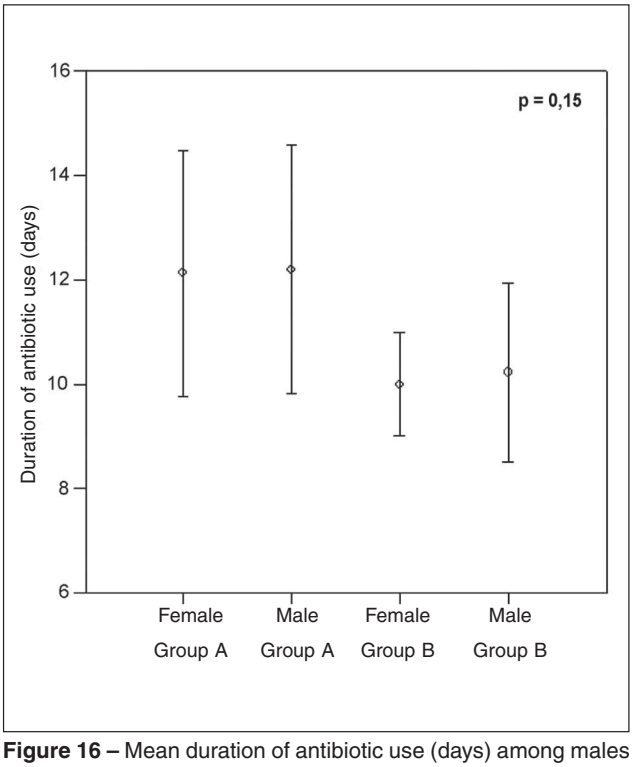

Figure 16 – Mean duration of antibiotic use (days) among males and females in groups A and B (Anova, $p = 0.15$)

The length of hospital stay in groups A and B was also taken into consideration during the statistical analysis. Through Student's t test, it was seen that in group A, the mean was 12.7 ± 2.1 days (median: 14 days; 95% CI: 11.7 – 13.9 days), and in group B, it was 10.6 ± 1.6 days (median: 10 days; 95% CI: 7.2 – 11.6 days), with $p = 0.01$ (Figure 17).

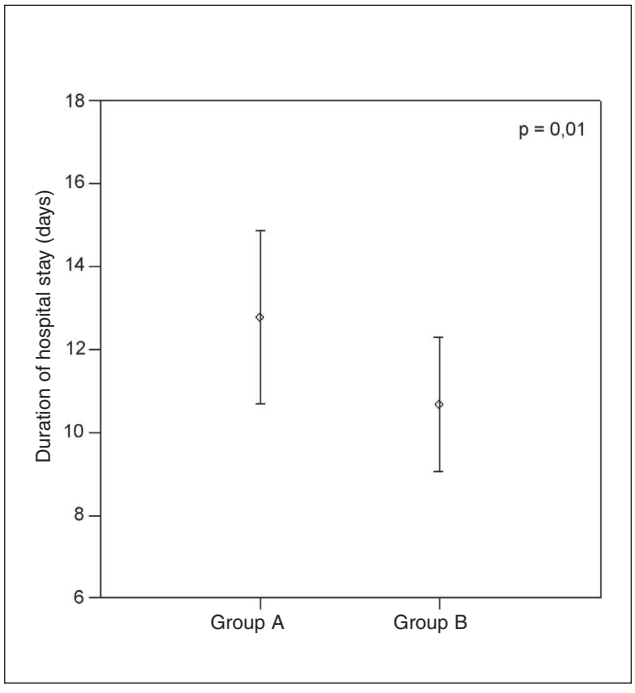

Figure 17 – Mean duration of hospital stay (days) in groups A and B (Student's t test, $p = 0.01$)

In comparing the length of hospital stay and age in group A, Spearman's regression test showed that there was no correlation between these variables ($p = 0.72$; r = 0.11) (Figure 18). The same was found in relation to group B using Spearman's test ($p = 0.45$; r = -0.23) (Figure 19).

In comparing the length of hospital stay between the sexes in the two groups, it was found in group A that the mean among females was 12.9 ± 2 days (median: 14 days; 95% CI: 11.5 – 14.3 days), and among males, it was 12.6 ± 2.4 days (median: 12 days; 95% CI: 10.5 – 14.7 days). In group B, the mean among females was 10.3 ± 0.6 days (median: 10 days; 95% CI: 9.7 – 11 days), and among males, it was 10.8 ± 1.8 days (median: 10 days; 95% CI: 9.5 – 12 days). Through the multiple analysis of variance test (Anova), it was seen that there was no significant difference between the groups ($p = 0.09$) (Figure 20).

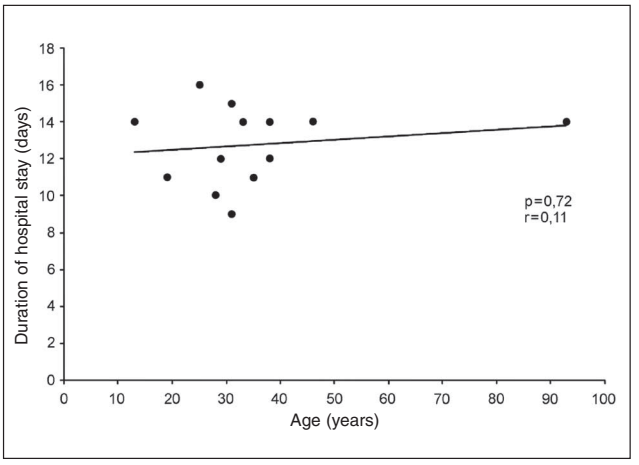

Figure 18 – Dispersion between age (years) and duration of hospital stay among patients in group A (Spearman's correlation test, $p = 0.72$, r = 0.11)

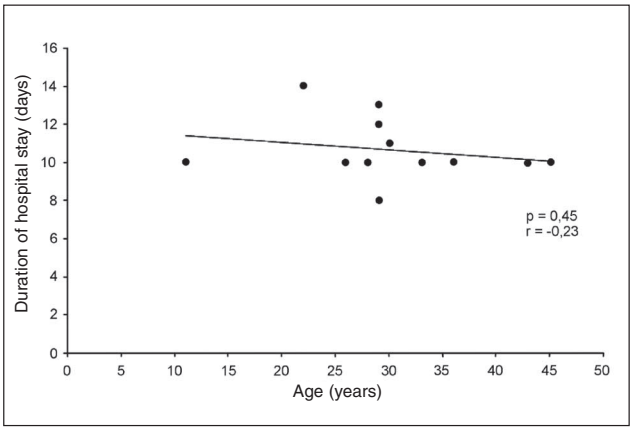

Figure 19 – Dispersion between age (years) and duration of hospital stay among patients in group B (Spearman's correlation test, $p = 0.45$, r = –0.23)

There were no pre or post-surgical complications of any nature in any of the patients in either group.

DISCUSSION

Tropical pyomyositis is a disease that may lead to serious complication, not only of a musculoskeletal nature but also of a systemic nature, and even death, and it has high incidence in countries with a tropical climate. Worryingly, this disease is being reported in countries of temperate climate more and more frequently.

Even though some authors have stated that tropical pyomyositis was first described by Scriba in 1885, *apud* Otones *et al*[16], Repáraz *et al*[19] and Marques *et al*[21], Chiedozi[5] was the first to classify it into three stages, which represent the gradual progression of the disease:

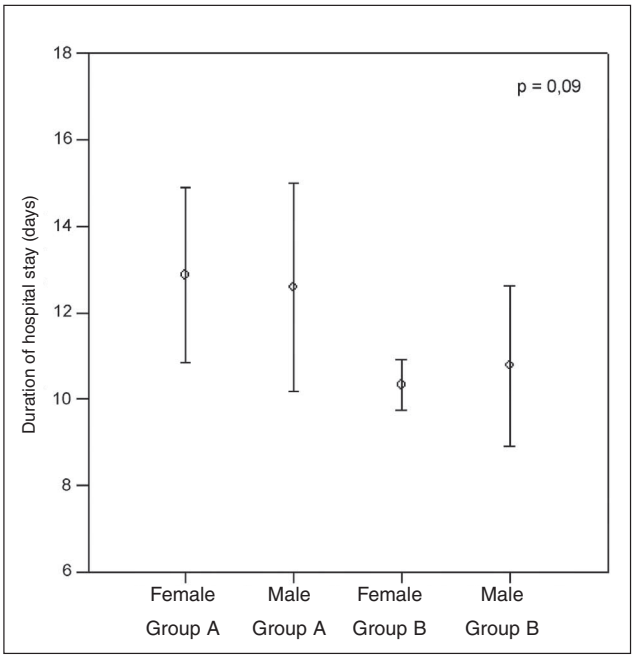

Figure 20 – Mean duration of hospital stay (days) among males and females in groups A and B (Anova, $p = 0.09$)

- Stage 1 – Insidious start, with numbness, tingling and progressive muscle pain associated with low fever. Sometimes there are nonspecific systemic signs of infection.
- Stage 2 – This occurs after 10 to 21 days of evolution and is the stage at which most patients seek medical assistance. There is intense edema, pain, erythema and local flushing, and abscess formation is characteristic.
- State 3 – Late stage, with severe pain and systemic manifestations of septic shock that require urgent action.

We agree with several other authors who have stated that stage II is the one most frequently diagnosed[26-,13,16,19,21,23]. In the present study, 100% of the patients were in stage II, and the main symptoms were fever, tumor formation, local flushing and pain.

Tropical pyomyositis may affect individuals of any age group[1-23]. The mean age in the present study coincided with what has been described by several other authors[1,2,6,7,9,12,13,17], with predominance in the second and third decades of life. We found that both groups were homogenous regarding age ($p = 0.41$) and the frequency of the sexes. It is of crucial importance to emphasize that, although there was a larger number of females in group A, Fisher's exact test showed that there was no statistical significance ($p = 0.11$) in relation to this variable. It is also worth remembering that the randomization process used in this study, with opaque sealed envelopes, has been validated and is used by the great majority of researchers within the field of medicine[26,27].

The etiological agent most commonly found in this study, in both groups, was *Staphylococcus aureus* (72%), as has also been described in the specialized literature[11,12,14,18-24]. This result provides support for starting to administer drug treatment, even if only empirically, if a diagnosis of tropical pyomyositis is suspected.

King *et al*[11] put forward the hypothesis that tropical pyomyositis starts with the formation of an intramuscular hematoma subsequent to trauma that then becomes colonized through an episode of bacteremia. We disagree with these authors regarding the need for there to be prior muscle bruising and organized hematomas. In the present study, we observed that the major muscle groups of the trunk and upper limbs were the ones most affected, but without any relationship with previous physical trauma.

We believe that that the fact that these muscle groups are the ones most required in most occupations, and particularly in manual occupations, may be responsible for triggering a greater number of intrinsic lesions and small-scale occurrences of bleeding within the myofibrils, without necessarily requiring muscle bruising or the formation of organized hematomas.

With regard to antibiotic therapy, even through the difference in the mean duration of antibiotic use between the two groups was minimal, it was sufficient to acquire a statistically significant nature ($p = 0.02$).

According to the results obtained, we observed that the shorter duration of antibiotic therapy in group B was unrelated to the patients' ages or sex in either group (Figures 14, 15 and 16). In the sparse literature available, we did not find any author who mentioned the length of antibiotic use in relation to patients' ages or sex, in treatments for tropical pyomyositis. Nonetheless, we can infer that the absence of large surgical incisions and the consequent lower degree of tissue damage to the soft-tissue envelope, in patients who underwent percutaneous drainage of the abscesses, contributed towards the shorter duration of antibiotic use.

A clear diminution of the length of hospital stay was also observed among the patients in group B, compared with the patients in group A ($p = 0.01$).

Among the results found, even though there was a slight tendency towards a statistical correlation between the length of hospital stay and the patients' sex ($p = 0.09$), the tests performed demonstrated that the reduction in hospital stay was unrelated to the patients' ages or sex (Figures 18, 19 and 20). Again, we did not find any author in the literature who mentioned any possible relationship between the duration of antibiotic use and patients' ages or sex, in cases of tropical pyomyositis. It can be deduced that the lower degree of tissue aggression caused by percutaneous drainage of the abscesses provided the group B patients with a shorter clinical recovery period and, consequently, earlier release from hospital.

Absence of complications before and after the surgery has also been reported by several other authors who performed the classical open surgical procedure up to the level of Chiedozi stage 2[4,6,8,12,13].

CONCLUSION

In this study, percutaneous drainage of the abscesses in association with antibiotic therapy constituted an effective method for treating tropical pyomyositis (Chiedozi grade II), thereby shortening the patients' total duration of antibiotic use and hospital stay.

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