The Professional Medical Journal
www.theprofesional.com

DOI: 10.17957/TPMJ/17.3228

ORIGINAL PROF-3228

PYOMYOSITIS;

FREQUENCY AND ITS COMMON BACTERIA WITH THEIR ANTIBIOTIC SENSITIVITY AMONG CHILDREN WITH HIGHLY SUSPECTED CLINICAL FEATURES

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Article received on:
28/12/2015
Accepted for publication:
29/09/2016
Received after proof reading:
18/01/2017

ABSTRACT… Pyomyositis is a common health problem with significant complications and morbidity. Surgical drainage and Antibiotic treatment is the mainstay of its treatment. Proper culture and sensitivity of etiological bacteria is crucial for successful treatment of Pyomyositis. **Objectives:** To determine the frequency of Pyomyositis and its common bacteria with their antibiotics sensitivity among children presenting with highly suspected clinical features. **Design:** Cross sectional descriptive study. **Setting:** Department of Orthopedics and Trauma, Khyber Teaching Hospital, Peshawar. **Period:** 12 months from19th July, 2012 to 18th July, 2013. **Materials and Methods:** 156 patients presented with highly suspected clinical features of Pyomyositis were examined clinically and were investigated by Ultra sound and CBC. Those patients who were having Pyomyositis, pus samples were taken for culture and sensitivity test and the data was analyzed by Statistical Package for Social Sciences (SPSS) version 10.0. **Results:** There were147 (94.23%) patients having Pyomyositis out of 156 patients. On culture and sensitivity test, 87 (59.18%) have positive growth while 60 (40.82%) have no growth. The most common bacteria isolated was Staphylococcus aureus55 (63.21%) followed by E. coli 10 (11.49%), Pseudomonas Aeruginosa 7 (8.04%), and Streptococcus Pyogenes 5 (5.74%). All isolated bacteria showed more than 95% and 90% sensitivity to Vancomycinand and Fusidic acid respectively while all bacteria showed maximum resistance to Penicillin i.e. more than 35%. **Conclusion:** Prompt diagnosis of pyomyositis in highly suspected patients, detection of its etiological bacteria and their antibiotic sensitivity tests are very important for the treatment of Pyomyositis.

Key words: Pyomyositis; Culture and sensitivity; Antibiotics

Article Citation: Khan S, Khan MA, Iqbal J, Saleem S. Pyomyositis; frequency and its common bacteria with their antibiotic sensitivity among children with highly suspected clinical features. Professional Med J 2017;24(1):188-194.
DOI: 10.17957/TPMJ/17.3228

INTRODUCTION

Pyomyositis in the appendicular system is the collection of pus in the muscular compartments of upper and lower limbs as result of bacterial inoculation through hematogenous rout.[1] Pyomyositis is a common clinical presentation in outpatient department of orthopedics, general surgery and medicine accounting for about 4% of hospital admission in tropical countries.[2]

It may present as a single or multiple abscesses. The exact pathogenesis is unknown with a current incidence of 1 in 5000.[3] Early diagnosis and prompt treatment is very important to avoid its complications. Because the complications like osteomyelitis and the resultant pathological fractures are very difficult to treat.[4] So it is very important to have a very methodical and evidence based approach in treating Pyomyositis. It is often not diagnosed until the later stages of infection.[5]

It is more common in children. 85% cases are reported in below 16years of age.[6,7] although the incidence of Pyomyositis is more in the immune compromised people especially HIV patients and patients receiving immune compromising medication[8], it usually occurs in young healthy individual. Classically, it is an infection of the tropics, occurring in previously active and healthy young men.[9] Pyomyositis in temperate countries is often regarded as an infection that occurs in hosts who are immune compromised or otherwise debilitated.[10]

Lower extremity is most commonly affected especially the iliopsoas region and thigh.[11] Any delay or inadequacy in treatment can lead to significant morbidity and mortality.[2] The prognosis is directly related to host factors, the virulence of the infecting organism, and the promptness of treatment.[6]

Most of the published data on Pyomyositis is from western literature although it is more common in our set up because of the hot climate and poor immune system due to malnutrition.[12] Therefore, the knowledge of prevalent pathogens, clinical presentation and disease outcome in our set up is very important.[13] Staphylococcus aureus is the most common organism causing Pyomyositis in up to 82 %, gram negative organisms (Escherichia Coli) in 14% and anaerobes in 10% of cases.[9] Streptococcus pyogenes (9%) and in about 40% cases no growth is found.[8]

These patients are mostly treated on trial and error basis without proper culture and sensitivity. This may be due to lack of awareness and underestimation of the value of culture and sensitivity and importance of selecting proper antibiotics by general practitioner and Quacks.[14] The empirical antibiotic choices should be made according to the likely etiological organism and then subsequently modified according to the culture and sensitivity results.[15] The empirical treatment should include the methicillin resistant Staphylococcus aureus as its proportion of infection has been reported to raise to about 35%.[8]

The Rationale of this study was that it will help us to identify Pyomyositis among patient who present with highly suspected clinical features and the current frequency of its most common causative bacteria and their antibiotic sensitivity in our population. The results will be used to make recommendations regarding treatment strategies of Pyomyositis. The results of this study will be disseminated to other health professionals and suggestions will be given for proper use of antibiotics in treating the disease. This will help us in reducing the complications associated with Pyomyositis

OBJECTIVE

The objective of the study was to determine the frequency of pyomyositis and its common bacteria with their antibiotic sensitivity among children presenting with highly suspected clinical features.

MATERIAL AND METHODS

This cross sectional descriptive study was conducted in Orthopedics and trauma unit, Khyber teaching hospital, Peshawar, Pakistan from 19th July, 2012 to 19th march, 2013 comprising of 156 patients selected by consecutive non probability sampling. The inclusion criteria adopted was; all patients of either gender, 16 years of age and below who were presented with highly suspected clinical features of pyomyositis i.e. swelling of the limb, pain in the limb and fever of less than 14 days duration. (Upper and lower limb). Patient with cellulites, immune compromised and diabetic patients, those having acute osteomyelitis and those who had received multiple antibiotics as empirical treatment or one antibiotic for more than 24hours and those with history of sharp penetrating injury, were excluded from the study.

After approval from research and ethical committee, all patients who presented to orthopedics OPD, Khyber teaching Hospital, Peshawar with highly suspected features of pyomyositis i.e. swelling in the limbs, generalized body temperature, pain at the affected limb were included in the study. Pyomyositis was diagnosed on the basis of presence of pus in the deep muscular compartment localized and confirmed by ultrasound, demonstration of frank pus from the muscular compartment of upper or lower limb by needle aspiration (culture in the laboratory) and White Blood Cell count of more than 11,000/mm3 on Full Blood Examination in the laboratory. Common Bacteria studied were Staphylococcus aureus, Escherichia coli, Streptococcus pyogenes. Bacterial antibiotic sensitivity: was often done by the Kirby-Bauer method and antibiotics tested were Ampicilin, Cefazolin, Vancomycin, Gentamicin, Ciprofloxacin,

Ofloxacin, Cefaperazone+Sulbactum, Methicillin, Ceftriaxone, Cefotaxime, Levofloxacin, Amikacin, Meropenem, Piperacillin/tazobactam, Imipenem, Linezolid. The purpose and benefits of the study were explained to the parents of all patients and all of them were assured that the study was done purely for research and data publication and if agreed upon, a written informed consent was obtained. Demographic characteristics were recorded.

The presence of pus in the deep muscular compartment was localized and confirmed by ultrasound. Before starting antibiotics, aspiration of the limb swelling was done by aseptic technique using sterile 5cc disposable syringes with an 18 gauge spinal needle as the 18 gauge spinal needle had the advantage of greater obturator to prevent skin biopsy. From each patient, two aspiration samples from the swelling of the limb were collected in two different syringes each containing 3cc of pus. Both the syringes were sent immediately within 30 minutes to the Pathology department medical laboratory, Khyber Medical College, Peshawar to detect pyomyositis. Once pyomyositis was detected, the other sample was subjected to microscopic examination and Gram staining and culture of Gram-positive and Gram-negative organisms and their antibiotic sensitivity. The culture material were inoculated on 5% sheep blood agar and Mac conkey agar simultaneously under the supervision of a microbiologist who had 5 years experience in Microbiology. The culture media was placed under aerobic condition at 37° centigrade and monitored for growth of colonies of staphylococcus aureus, E coli and Streptococcus pyogenes. The isolated bacteria were recognized based on their characteristic growth and biological reactions. The colonies were transferred to Nutrient agar for sensitivity testing by Kirby-Baeur Disk diffusion method. Commonly used antibiotics: Penicillin, Methicillin, Amoxicillin, Amikacin, Gentamicin, Ceftriaxone, Cefuroxime, Ciprofloxacin, Levofloxacin and Linezolid against the specific bacteria were tested, as listed in the proforma annexed. All admissions during the study period were included in the study and results were recorded on a structured proforma annexed. Strict exclusion criteria were applied to control confounders and bias in the study results.

Data was analyzed by using a statistical software SPSS version 16.0. All the results were presented in the form of graphs and tables.

RESULTS

The total number of patients presenting with highly suspected clinical features of Pyomyositis were 156, and among these patients 147 (94.23%) patients were having Pyomyositis and 9 (5.77%) patients were having no Pyomyositis after doing ultrasound of the affected region and aseptic needle aspiration of the swelling. The total number of male and female patients was 85(57.82%) and 62(42.18%) respectively having Pyomyositis with male to female ratio of 1.37:1. The mean age of male and female patients with Pyomyositis was 9.53 years ± 4.99SD and 9.60 years ± 4.75SD respectively with an overall mean age of 9.50 years ± 4.88SD.

Maximum number of patients presenting with Pyomyositis were 69(46.94%) from the age group of 11 to 16 years followed by 48 (32.65%) and 30 (20.41%) patients from the age groups of 1 to 5 and 6 to 10 years respectively. Full detail is shown in Table-I.

Age Groups	Frequency
1-5 years	48 (32.65%)
6-10 years	30 (20.41%)
11-16 years	69(46.94%)

Table-I. Age distribution of patients with pyomyositis

The most common site was thigh in 61 (41.50%) cases, followed by pelvis 45 (30.61%) and Arm 23 (15.65%), calf 10 (6.80%) and forearm 8 (5.44%). On culture and sensitivity test, 87 (59.18%) have positive growth while 60 (40.82%) has no growth. According to gender wise distribution, 49 (56.32%) males and 38 (43.67%) females has positive growth on culture and sensitivity test.

The most common bacteria isolated was Staphylococcus aureus55 (63.21%) followed

byE. coli 10 (11.49%) Pseudomonasaeruginosa7 (8.04%) and streptococcus pyogenes 5 (5.74%) Among the 55 staphylococcus aureus10 (18.18%) were resistant to Methicillin, Methicillin resistant staphylococcus aureus, MRSA positive. According to gender wise distribution of isolated bacteria in Pyomyositis on culture sensitivity, Staphylococcus aureus was isolated in 33 (60%) males and 22(40%) females, E. coli in 5 (50%) males and 5(50%) females.

On culture and sensitivity test, Streptococcus aureus showed high sensitivity to Vancomycinin 55 (100%) cases followed by Fusidic acid 51 (92.73%) and Gentamicin 46 (83.64%). Streptococcus aureus showed high resistance to penicillin in 20 (36.36%) patients followed by resistance to erythromycin in 15 (27.27%) patients. E. coli showed high sensitivity to both Vancomycin and Fusidic acid in 9 (90%) cases in each followed by Amikacin and Gentamicin in 8(80%) patients each. The resistance of E. coli was noted maximum to penicillin which was in 4 (40%) patients followed by resistance to ciprofloxacin and Erythromycin in 3 (30%) cases each. Pseudomonas aeruginosashowed high sensitivity to Vancomycinand Fusidic acid in 7 (100%) and 6 (85.71%) cases respectively. Pseudomonas aeruginosa showed high resistance to penicillin in 3(42.85%) patients followed byresistance to ciprofloxacin and Erythromycin in 2(28.58%) and 1 (14.29%) patients respectively. Streptococcus pyogenes showed high sensitivity to Vancomycinin 5 (100%) cases followed by Fusidic acid and Gentamicin in 5 (100%) and 4 (80%) patients respectively. The resistance of streptococcus pyogenes was noted in maximum to penicillin in 1(20%) patients. Sensitivity and resistance ofthese 4 bacteria to various antibiotics is shown in detail in Table-II.

Antibiotic	Staphylococcus aureus n=55		E. coli n=10		Pseudomonas aeruginosa n=7		Streptococcus Pyogenese n=5	
	S	R	S	R	S	R	S	R
Fusidic acid	51(92.73%)	4(7.27%)	9(90%)	1(10%)	6(85.71%)	1(14.29%)	5(100%)	0(0%)
Amikacin	45(81.82%)	10(18.18%)	8(80%)	2(20%)	5(71.43%)	2(28.58%)	4(80%)	1(20%)
Ciprofloxacin	41(74.55%)	14(25.45%)	7(70%)	3(30%)	18(69.23%)	2(28.58%)	4(80%)	1(20%)
Vancomycin	55(100%)	0 (0%)	9(90%)	1(10%)	7(100%)	0 (0%)	5(100%)	0(0%)
Gentamicin	46(83.64%)	9(16.36%)	8(80%)	2(20%)	6(85.71%)	1(14.29%)	4(80%)	1(20%)
Erythromycin	40(72.73%)	15(27.27%)	7(70%)	3(30%)	6(85.71%)	1 (14.29%)	3(60%)	2(40%)
Penicillin	35(63.64%)	20 (36.36%)	6(60%)	4(40%)	4(57.14%)	3 (42.86%)	4(80%)	1(20%)

Table-II. Sensitivity and resistance of isolated bacteria inpyomyositis to various antibiotics
S= Sensitive R=Resistance

DISCUSSION

Pyomyositis is a suppurative infection of the large skeletal muscles without an apparent spread from contiguous structures.[16] Initially reported largely in the tropics, it has become a disease of worldwide occurrence, with many cases reported in temperate climates.[17] Thought to be due to seeding of a muscle from transient bacteremia, the exact pathophysiology is unknown, as only 5% to 37% of patients with Pyomyositis are bacteremic.[18] Despite the fact that it is very common in our country because of the long and humid summer season but there is very scanty published literature about Pyomyositis. Delay in seeking and getting proper medical care and the vague nature of the disease itself, makes its early diagnosis very difficult in our set up and patient most of the time presents with complication like osteomyelitis.[19]

In our study male patients were (57.82%) more than females (42.18%) having Pyomyositis with male to female ratio of 1.37:1. In a study conducted by Crum-Cianflone NF, et al,[20] Bacterial, Fungal, Parasitic, and Viral Myositis. in 2008 male predominance was observed. In their study there was no age limit and patients of all age groups were included. Pannaraj PS et al[8] included

patients children ranging in age from 0.06 to 15years. LlorenteOtones L et al in their study conducted from 2002 to 2005 the mean age of their patients was 8.6 years. According toWongSl et al,[21] in tropical and temperate climate majority of the pediatric pyomyositis cases occurred in children within the first decade of life. In their study only pelvic pyomyositis, which may present more often in teen aged patients. With an average age of 12.8 years, the patients detailed here are older than those in reports including all cases of pyomyositis, regardless of infection site. 6 of our 8 patients were older than 10 years. Although the group examined in this review consists of only 8 patients, this age distribution is important to recognize. In our study 79 out of 156 patients (50.64%) were in the age group of 11 to 16 while 48 (30.77%) were in 1 to 5 years age group.

In our study the most common site was thigh in 61 (41.50%) cases, followed by pelvis 45 (30.61%) and upper limb 23 (15.65%), while in LlorenteOtones L et al iliao psoas region was the most common site affected.[5] In Bickels, J. et al,[22] supporting our results, the most common site of infection is the quadriceps muscle, followed by the gluteal and iliopsoas muscles, with upper-extremity muscles being affected less frequently.

On culture and sensitivity test in our study, bacterial growth was obtained in 58.33%samples while 41.66% samples yielded no growth. A study done by Pannaraj PS et al[8] published in 2006 there was no bacterial growth in 40% of the specimens. So our results were comparable with their results. This high percentage of negative culture and sensitivity reports were partially of the reason that we did not use any culture media for fungi and viruses. But Nancy F. Crum-Cianflone[12] reported high percentage of viral, fungal and parasitic myositis. The most common bacteria isolated were Staphylococcus aureus (63.21%) followed by E. coli (11.49%) Pseudomonas Aeruginosa (8.04%), and streptococcus pyogenes (5.74%). In Pannaraj PS et al[8] S. aureus (in 57.8% of children) and Streptococcus pyogenes (in 2.2%) were the most common bacteria causing Pyomyositis. They observed an increase in community acquired methicillin resistant staphylococcus areues (cMRSA) causing Pyomyositis in children. 62.5% patients were reported cMRSA positive.[8] In contrast to Pannaraj PS et al[8], in our study, 32.72% were cMRSA positive. In the study by LlorenteOtones L et alin Madrid,[5] staphylococcus areues was the main pathogen in about 42.85% of cases. Karen J et al,[23] identified 6 case of E coli in their study carried out from 2003 to 2007 while in our study the total number of patients with E coli Pyomyositis were 10. The clinical course of E. coli pyomyositis is usually benign. However, in Karen J et al,[23] case series, 50% of the patients required intensive care unit transfer secondary to hypotension, and 33% died. To the contrary none of the patient in our study required ICU care and the mortality rate was zero.

Appropriate antibiotic therapyis necessary to treat Pyomyositis along with adequate surgical therapy. Factors which are to be considered in choosing the appropriate antibiotic(s) include infection type, infecting organism, sensitivity results, host factors, and antibiotic characteristics. Initially, antibiotics are chosen on the basis of the organisms that are suspected to be causing the infection. On culture and sensitivity test in our study, Streptococcus aureus showed high sensitivity to Vancomycin (100%) followed by Fusidic acid (92.73%), Gentamicin (84.64%) and Amikacin (81.82%). Streptococcus aureus showed high resistance to penicillin (36.36%) followed by resistance to erythromycin (27.27%). E. coli showed equally high sensitivity to both Vancomycin and Fusidic acid (90%) followed by Amikacin and Gentamicin (80%) each. The resistance of E. coli was noted maximum to penicillin (40%) followed by resistance to ciprofloxacin and Erythromycin (30%) each. Pseudomonas aeruginosa showed high sensitivity to vancomicin (100%), followed by Fusidic acid (85.71%). Pseudomonas aeruginosa showed high resistance to penicillin (42.86%) patients followed by resistance to ciprofloxacin and Erythromycin (28.58%) each. Streptococcus pyogeneseshowed high sensitivity to vancomicinandFusidic acid (100%), followed by Gentamicin,Amikacin, ciprofloxacin and penicillin each (80%). The resistance

ofStreptococcuspyogenese was noted in maximum to Erythromycin (40%).In our study the resistance to penicillin, erythromycin and Quinolones was attributed to self-medicationof these antibiotics by patients. Other main important issue is the prescription of these antibiotics by local dispensers and general practitioners without proper culture and sensitivity tests.

In Karen J et al al[23], E. coli isolates were fluoroquinolone resistant; 55% produced an extended-spectrum β-lactamase (ESBL). 33% died despite the received Carbapenem intravenously and were treated in Intensive care unit.

In studies from developed world intravenous antibiotics followed by oral antibiotics were the only treatment given to their patients. Surgical intervention in the form of incision and drainage of the abscess was required only few patients. While in our study more than 80% of the patients were subjected to some sort of surgical intervention like incision and drainage or percutaneous aspiration of the abscess. The obvious reason beyond it was that our patients presented in stage 3 of Pyomyositis while their patients were presented mostly in stage1 or stage 2 diseases. According to Wong SL et al,[21] 50% of their patients were presented in stage 1 disease where antibiotics only, was the sufficient treatment.

CONCLUSION

From the results of my study it has been concluded that;

- Patient spresenting with history of painful swelling, fever, malaise, and difficulty in moving the effected limb, may or may not be with a history of a blunt trauma or extreme of unaccustomed activity, should be suspected for Pyomyositis and should be properly investigated to catch the disease at earlier stage and avoid the complications.
- A very low threshold should be kept for the diagnosis of Pyomyositis as the symptom and signs may be very vague and deceiving, and if the routine investigations fail to reveal the diagnosis, MRI should be done promptly to avoid unnecessary delay in the treatment.
- The most common bacteria of Pyomyositis in our set up are Staphylococcus aureus, E. coli, Pseudomonas aeruginosa and Streptococcus pyogenes. The empirical antibiotics used for the treatment of Pyomyositis must cover these common bacteria as it will help in the early treatment of such patients and reducing associated complications with Pyomyositis.

REFERENCES

1. Ovadiaa D, Ezraa E, Ben-Sirab L, Kesslerb A, BickelsaJ, Kereta D. **Primary pyomyositis in children: a retrospective analysis of 11 cases.** J PediatrOrthop 2007; 16:153–9.
2. De Boeck H. **Osteomyelitis and septic arthritis in children.** ActaOrthopBelg 2005; 71(5):505-15.
3. Damir D, Toader E, Crețu A. **Correlative aspects involving hematogenous osteomyelitis at children and adults.** Rev Med ChirSoc Med Nat Iasi 2011; 115(1):269-76.
4. Dessì A, Crisafulli M, Accossu S, Setzu V, Fanos V. **Osteo-articular infections in newborns: diagnosis and treatment.** J Chemother 2008; 20(5):542-50.
5. LlorenteOtones L, VázquezRomán S, Iñigo Martín G, RojoConejo P, González Tomé MI. **Pyomyositis in children: not only a tropical disease.** An Pediatr (Barc) 2007; 67(6):578-81.
6. Shetty AK, Kumar A. **Osteomyelitis in adolescents.** Adolesc Med State Art Rev 2007; 18(1):79-94.
7. Kumar A, Anderson D. **Primary obturatorexternuspyomyositis in a child presenting as hip pain: a case report.** PediatrEmerg Care 2008; 24(2):97-8.
8. Pannaraj PS, Hulten KG, Gonzalez BE, Mason EO Jr, Kaplan SL. **Infective pyomyositis and myositis in children in the era of community acquired,** methicillin resistant staphylococcus aureusInfectionClin Infect Dis 2006; 43(8):953-60.
9. Zalavras CG, Rigopoulos N, Poultsides L, **PatzakisMJ. Increasedoxacillin resistance in thigh pyomyositis in diabetic patients.** ClinOrthopRelat Res 2008; 466(6):1405.
10. García C, Hallin M, Deplano A, Denis O, Sihuincha M, de Groot R, et al. **Staphylococcus aureus causing tropical pyomyositis, Amazon Basin, Peru.** Emerg Infect Dis 2013 Jan; 19(1):123-5.

11. Small LN, Ross JJ. **Tropical and temperate pyomyositis.** Infect Dis Clin North Am 2005; 19(4):981.

12. Nancy F, Crum-Cianflone. **Bacterial, fungal, parasitic, and viral Myositis.** MicrobiolRev 2008 July; 21(3):473-94.

13. Crossley M. **Temperate pyomyositis in an injecting drug misuse: a difficult diagnosis in a difficult patient.** Emerg Med J 2003; 20:299-300.

14. Olson DP, Soares S, KanadeSV. **Community acquired MRSA pyomyositis: case report and review of the literature.** J Trop Med 2011; 2011:970848.

15. Werdin F, Tennenhaus M, Schaller H, Rennekampff H. **Evidence based management strategies for treatment of chronic wounds.** Eplasty 2009; 9:e19.

16. Chiu SK, Lin JC, Wang NC, Peng MY, Chang FY. **Impact of underlying diseases on the clinical characteristics and outcome of primary pyomyositis.** J MicrobiolImmunol Infect 2008; 41(4):286-93.

17. Fox LP, Geyer AS, Grossman ME. **Pyomyositis.** J Am AcadDermatol 2004 Aug; 51(2):308-14.

18. Crum NF. **Bacterial pyomyositis in the United States.** Am J Med 2004 Sep 15; 117(6):420-8.

19. Husain S, Singh N. **Pyomyositis associated with bacillary angiomatosis in a patient with HIV infection.** Infections 2002; 30:50-3.

20. Crum-CianfloneNF, Truett AA, Teneza-Mora N, Maves RC, Chun HM,Bavaro MF, Hale BR. **Unusual presentations of coccidioidomycosis: a case series and review of the literature.** Medicine (Baltimore) 2006; 85:263-77.

21. Wong SL, Anthony EY, Shetty AK. **Pyomyositis due to Streptococcus pneumoniae.** Am J Emerg Med 2009 Jun; 27(5):633.e1-3.

22. Bickels J, Ben-Sira L, Kessler A, Wientroub S. **Primary pyomyositis.** J Bone Joint Surg Am2002; 84:2277-86.

23. Vigil1 KJ, Johnson JR, Johnston BD, Kontoyiannis DP, Victor E. **Escherichia coli Pyomyositis: an emerging infectious disease among patients with hematologic malignancies.** MulanovichClin Infect Dis 2010; 50 (3):374-80.

"Learn the rules like a pro,
so you can break them like an artist."

Pablo Picasso

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