Pertanika J. Sci. & Technol. 30 (3): 2071 - 2076 (2022)

PERTANIKA JOURNALS

SCIENCE & TECHNOLOGY

Journal homepage: http://www.pertanika.upm.edu.my/

Case Study

An Unusual Cause of Tenosynovitis by Group B *Streptococcus* in the Immunocompromised Patient: A Case Report

AbdulRahman Muthanna[1], Nur Afiza Aziz[2], Mohd Nasir Mohd Desa[1], Nurul Diana Dzaraly[1], Nurul Hana Zainal Baharin[1], Mohammad Noor Amal Azmai[3] and Syafinaz Amin-Nordin[4]*

[1]Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia
[2]Department of Pathology, Sultanah Aminah Hospital, 80000 Johor Bahru, Johor, Malaysia
[3]Department of Biology, Faculty of Science, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia
[4]Department of Medical Microbiology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

ABSTRACT

This case report describes a 49-year-old immunocompromised woman with tenosynovitis of the left middle finger caused by Group B *Streptococcus* (GBS). She claimed that a fishbone picked over her left middle finger. An orthopaedic surgeon operated for incision and drainage of pus discharge, wound debridement of the left middle finger and A1 and A2 pulley release. Treatment was initiated with parenteral cefepime three times per day given the growth of mixed *Enterobacter* species on the culture media and continued with oral cefuroxime twice daily upon discharge for one week. Unfortunately, during the orthopaedic clinic follow-up, the wound was unclean with a slough and skin necrotic patch. Therefore, Ray's amputation of the left middle finger proceeded. This case contributes to further investigation of the GBS tenosynovitis due to the rise in GBS invasive infections and shows the importance of early diagnosing and initiating treatment with antibiotics that are effective against this pathogen.

Keywords: Group B *Streptococcus*, human, immunocompromised, tenosynovitis

ARTICLE INFO

Article history:
Received: 29 December 2021
Accepted: 2 March 2022
Published: 20 April 2022

DOI: https://doi.org/10.47836/pjst.30.3.17

E-mail addresses:
dr.abm1990@gmail.com (AbdulRahman Muthanna)
nurafiza45@gmail.com (Nur Afiza Aziz)
mnasir@upm.edu.my (Mohd Nasir Mohd Desa)
diana.dzaraly@gmail.com (Nurul Diana Dzaraly)
misshanazainal@gmail.com (Nurul Hana Zainal Baharin)
mnamal@upm.edu.my (Mohammad Noor Amal Azmai)
syafinaz@upm.edu.my (Syafinaz Amin-Nordin)
*Corresponding author

ISSN: 0128-7680
e-ISSN: 2231-8526

INTRODUCTION

Tenosynovitis is most often an infection caused by gram-positive bacterial infections. Most cases of tenosynovitis are caused by *Staphylococcus aureus*, which accounts for 80% of all cases (Stewart & Ward, 2020). However, group B streptococcal soft tissue infections, which often lead to septicaemia and amputation in immunocompromised patients such as inflammatory arthritis, diabetes, cancer, and others, have been on the rise, which ranged from 13.9% to 38% (Pang et al., 2007; Karunakaran et al., 2009). Most cases of suspected tenosynovitis should be treated surgically immediately; however, healthy patients can be treated with antibiotics alone for the first day and then reassessed to determine whether surgery is necessary (Franko & Abrams, 2013). According to a study, around 54% (302 out of 561) of cases were successfully treated with antibiotics and surgery, compared to 9.6% (17 out of 177) of cases successfully treated by surgery without antibiotics (Hyatt & Bagg, 2017). With the paucity of literature, this case reported GBS tenosynovitis in an immunocompromised patient. This report describes the diagnosis and treatment of tenosynovitis caused by GBS. Several disciplines played an important role in treating the patient, including primary care, orthopaedic surgery, radiology, and infectious disease. Orthopaedic surgeons diagnosed the patient and performed Ray's amputation of the left middle finger; radiologists took x-rays, while the clinical microbiologists identified the isolates and tested the antimicrobial susceptibility. The hospital ethics committee approved the publication of this case report based on an approval letter from the Medical Research and Ethics Committee of the Malaysian Ministry of Health.

CASE REPORT

On May 27, 2020, a 49-year-old Malaysian female with underlying diabetes mellitus (defaulted on follow up for five years) was admitted to the Hospital Sultanah Aminah, Johor Bahru, complaining of left middle finger pain and oedema. She reported that a fishbone punctured her finger three days prior to admission. She poked the swollen finger with a needle and observed minimal pus discharge and bleeding.

At the presentation time, the patient's vital signs were as follows: her blood pressure was 125/74 mmHg, her heart rate was 100 beats/minute, her body temperature was 36.9°C, and her oxygenation level was 98%. On examining her left hand, a blackish discolouration at the finger pulp with fusiform swelling up to the mid-hand was observed. Subsequent swelling occurred over the pulp of the left middle finger, and the swelling further extended to the metacarpal joints of the left middle finger. There was tenderness up to the distal 1/3 of the middle finger and erythematous surrounding the skin on palpation. A diagnosis of flexor tenosynovitis with pulp necrosis was made for the left middle finger. No other significant physical findings were noted. An X-ray of the left hand demonstrated a gas shadow over the top of the left middle finger (Figure 1).

Laboratory tests indicated that the leukocyte count was 5.2 × 10^9/L (53.1% neutrophils, 33.9% lymphocytes, 7.6% monocytes, 5% eosinophils, and 0.4% basophils), with a haemoglobin level of 115 g/L and a C-reactive protein level of 8 mg/L (normal range: <5 mg/L). The sodium, potassium, chloride, urea, creatinine, and eGFR CKD-EPI levels were normal, while the Haemoglobin A1c level (7.3%) was high.

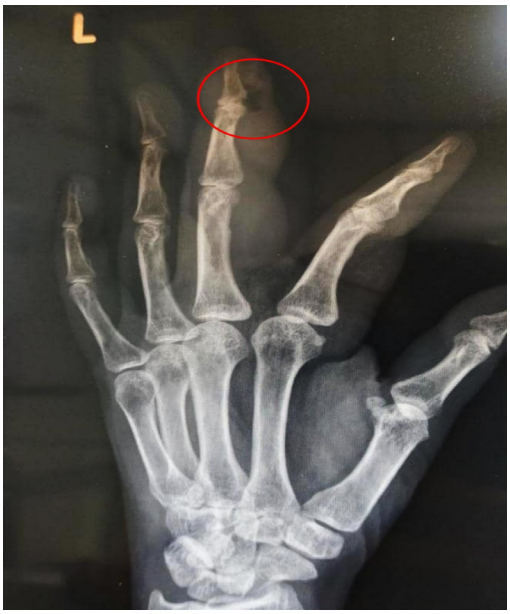

Figure 1. An X-ray of the left hand with a gas shadow over the top of the left middle finger indicates an anaerobic bacterial infection

The Gram-staining of pus aspirate revealed numerous pus cells with Gram-positive cocci (GPC), while the tissue revealed a few pus cells with Gram-negative bacilli (GNB). After overnight cultivation of the pus aspirate and tissue samples on blood agar, this report observed the growth of grey–whitish colonies surrounded by a β-haemolysis zone. The isolates were confirmed as GBS by a negative catalase test, a positive CAMP test, and a latex agglutination test (Oxoid™ Streptococcal Grouping Kit). Furthermore, the GBS isolates were positive for the *cfb* gene in a PCR analysis (Eskandarian et al., 2015). An antimicrobial susceptibility test was conducted on all isolates using disk diffusion and E-test methods. GBS isolates were sensitive to penicillin, clindamycin, erythromycin, ceftriaxone, and vancomycin (CLSI, 2020). The serotype was Ia based on a multiplex PCR assay using the protocol and specific primers that Imperi et al. (2010) developed. They were identified as sequence type (ST) 23 based on the Multilocus Sequence Typing (MLST) (Jones et al., 2003). *Enterobacter cloacae* which are sensitive to cefepime were also found in the tissue sample.

The patient was started empirically on cloxacillin 1 g QID and clindamycin 600 mg BD, administered intravenously for two days. She had undergone an operation for incision and the drainage of pus discharge, a wound debridement of the left middle finger, and an A1 and A2 pulley release. Intraoperative findings showed extensive sloughy subcutaneous tissue with a pus discharge of 5 mL and a friable pulley, digital nerve, and blood vessel. She was recommended for Ray's amputation of the left middle finger, but she refused. The antibiotic was changed to cefepime 2 g TDS for two days on the third day, given the bacterial cultivation results. After showing remarkable improvement on the following day, she was discharged from the hospital. She was advised to undergo daily wound dressing

at a primary health clinic and continue taking antibiotics (cefuroxime tablets 250 mg BD) for one week, followed by appointment at an orthopaedic clinic.

On the orthopaedic clinic review day, skin necrosis was noted until the left middle phalanx, and the flexor tendon was exposed with slough. Given the poor progression of the wound, she was counselled by the orthopaedic surgeon to have Ray's amputation of the left middle finger. Ray's amputation of the left middle finger was done on 1/7/2020. Two weeks later, the wound was checked. It was clean, with no breakdown, and the sutures were intact. The sutures were then removed. One month after Ray's amputation, the orthopaedic surgeon again checked the wound. It had healed well with minimal scarring. All the other fingers were able to flex and extend. The patient recovered without any sequelae and did not have difficulty using the left hand in daily activities.

DISCUSSION

GBS infections among non-pregnant adults have increased over the years. Bacteremia (22%), osteoarticular infection (21.4%), skin and soft tissue infections (18.4%) and abscesses (13.9%) were the most common manifestation (Graux et al., 2021). A recent study indicated that autoimmune disease, immunosuppressive therapy, and diabetes disorders or comorbidities were important predisposing factors for GBS invasive infections among non-pregnant adults. In several cases, soft tissue infections, including muscles, tendons, and ligaments, have been reported , leading to septicaemia and amputation (Vuillemin et al., 2021). Tenosynovitis is a surgical emergency caused by penetrating trauma to a digit. In 1933, Kanavel developed four cardinal signs to diagnose tenosynovitis, including symmetrical swelling of the whole finger, profound tenderness along the finger's length, semi flexed finger and extreme pain with passive extension of the affected finger. *Staphylococcus aureus* is the most common cause of tenosynovitis (Stewart & Ward, 2020). However, the incidence of tenosynovitis by GBS is unknown in the local setting. GBS patients suffer from more severe infections marked by high inflammation markers and the most frequent wound complications (Pattnaik et al., 2020). In this case, the serotype and the ST of the GBS were found to be serotype Ib and ST23 using the multiplex PCR and MLST. ST23 has been identified as a dominant strain commonly associated with invasive GBS infections (Chang et al., 2014; Ezhumalai et al., 2020). Another study found that human ST23 GBS can be pathogenic to fish, possibly due to phage recombination (Wang et al., 2017). In conclusion, detailed history and clinical suspicion are the critical factors to diagnose GBS infections in tenosynovitis. An increasing number of invasive GBS cases among non-pregnant adults requires identifying clinical characteristics and risk factors such as immunodeficiency and environmental hazard exposure. GBS responds well to antibiotic therapy. Therefore, treatment options for GBS may consist of penicillin, erythromycin, clindamycin, ceftriaxone, cefuroxime, and vancomycin, depending on cultural sensitivities.

ETHICAL APPROVAL

The Medical Research and Ethics Committee of the Malaysian Ministry of Health, National Medical Research Register approved the study (approval no. NMRR 19-876-46665) and subsequently by the Clinical Research Centre of Hospital Sultanah Aminah, Johor Bahru.

ACKNOWLEDGEMENTS

This research was funded by the Research University Grant from Universiti Putra Malaysia, reference number [UPM/800-3/3/1/GPB/2020/9683800]. The authors would like to thank all staff of the orthopaedic and pathology departments at Hospital Sultanah Aminah, Johor Bharu, Johor, for their kind help in preparing this report.

REFERENCES

Chang, B., Wada, A., Hosoya, M., Oishi, T., Ishiwada, N., Oda, M., Sato, T., Terauchi, Y., Okada, K., Nishi, J., Akeda, H., Kamiya, H., Ohnishi, M., Ihara, T., & Japanese Invasive Disease Study Group. (2014). Characteristics of group B *Streptococcus* isolated from infants with invasive infections: A population-based study in Japan. *Japanese Journal of Infectious Diseases*, *67*(5), 356-360. http://dx.doi.org/10.7883/yoken.67.356

CLSI. (2020). *Performance standards for antimicrobial susceptibility testing* (30th Ed.). Clinical and Laboratory Standards Institute.

Eskandarian, N., Ismail, Z., Neela, V., Van Belkum, A., Desa, M. N. M., & Nordin, S. A. (2015). Antimicrobial susceptibility profiles, serotype distribution and virulence determinants among invasive, non-invasive and colonizing *Streptococcus agalactiae* (group B *streptococcus*) from Malaysian patients. *European Journal of Clinical Microbiology & Infectious Diseases*, *34*(3), 579-584. https://doi.org/10.1007/s10096-014-2265-x

Ezhumalai, M., Muthanna, A., Suhaili, Z., Dzaraly, N. D., Amin-Nordin, S., Amal, M. N. A., & Desa, M. N. M. (2020). Multilocus sequence typing analysis of invasive and non-invasive Group B *Streptococcus* of hospital origin in Malaysia. *The Malaysian Journal of Medical Sciences: MJMS*, *27*(1), 134-138. https://doi.org/10.21315/mjms2020.27.1.14

Franko, O. I., & Abrams, R. A. (2013). Hand infections. *Orthopedic Clinics*, *44*(4), 625-634.

Graux, E., Hites, M., Martiny, D., Maillart, E., Delforge, M., Melin, P., & Dauby, N. (2021). Invasive group B *Streptococcus* among non-pregnant adults in Brussels-Capital Region, 2005–2019. *European Journal of Clinical Microbiology & Infectious Diseases*, *40*(3), 515-523. https://doi.org/10.1007/s10096-020-04041-0

Hyatt, B. T., & Bagg, M. R. (2017). Flexor tenosynovitis. *Orthopedic Clinics*, *48*(2), 217-227. http://dx.doi.org/10.1016/j.ocl.2016.12.010

Imperi, M., Pataracchia, M., Alfarone, G., Baldassarri, L., Orefici, G., & Creti, R. (2010). A multiplex PCR assay for the direct identification of the capsular type (Ia to IX) of *Streptococcus agalactiae*. *Journal of Microbiological Methods*, *80*(2), 212-214. https://doi.org/10.1016/j.mimet.2009.11.010

Jones, N., Bohnsack, J. F., Takahashi, S., Oliver, K. A., Chan, M. S., Kunst, F., Glaser, P., Rusniok, C., Crook, D. W. M., Harding, R. M., Bisharat, N., & Spratt, B. G. (2003). Multilocus sequence typing system for group B *streptococcus*. *Journal of Clinical Microbiology*, *41*(6), 2530-2536. https://doi.org/10.1128/JCM.41.6.2530-2536.2003

Kanavel, A. B. (1933). *The symptoms, signs, and diagnosis of tenosynovitis and major fascial-space abscesses. Infections of the Hand* (6th Ed.). Lea and Febiger Publisher.

Karunakaran, R., Raja, N. S., Hafeez, A., & Puthucheary, S. D. (2009). Group B *streptococcus* infection: Epidemiology, serotypes, and antimicrobial susceptibility of selected isolates in the population beyond infancy (excluding females with genital tract-and pregnancy-related isolates) at the University Malaya Medical Centre, Kuala Lumpur. *Japanese Journal of Infectious Diseases*, *62*(3), 192-194.

Pang, H. N., Teoh, L. C., Yam, A. K., Lee, J. Y. L., Puhaindran, M. E., & Tan, A. B. H. (2007). Factors affecting the prognosis of pyogenic flexor tenosynovitis. *The Journal of Bone & Joint Surgery*, *89*(8), 1742-1748. http://dx.doi.org/10.2106/JBJS.F.01356

Pattnaik, S., Syed, A., & Siddhardha, B. (2020). Pathogenesis, virulence factors, and antibiotic resistance of group B *streptococcus*. In *Model Organisms for Microbial Pathogenesis, Biofilm Formation and Antimicrobial Drug Discovery* (pp. 117-130). Springer. https://doi.org/10.1007/978-981-15-1695-5

Stewart, C. N., & Ward, C. M. (2020). Infectious flexor tenosynovitis following trigger finger release: Incidence and risk factors. *Hand, 2020*. https://doi.org/10.1177/1558944720930298

Vuillemin, X., Hays, C., Plainvert, C., Dmytruk, N., Louis, M., Touak, G., Saint-Pierre, B., Adoux, L., Letourneur, F., Frigo, A., Poyart, C., & Tazi, A. (2021). Invasive group B *streptococcus* infections in non-pregnant adults: A retrospective study, France, 2007–2019. *Clinical Microbiology and Infection*, *27*(1), 129-e1-129-e4. https://doi.org/10.1016/j.cmi.2020.09.037

Wang, R., Li, L., Huang, Y., Huang, T., Tang, J., Xie, T., Lei, A., Luo, F., Li, J., Huang, Y., Shi, Y., Wang, D., Chen, M., Mi, Q., & Huang, W. (2017). Pathogenicity of human ST23 *Streptococcus agalactiae* to fish and genomic comparison of pathogenic and non-pathogenic isolates. *Frontiers in Microbiology*, *8*, Article 1933. https://doi.org/10.3389/fmicb.2017.01933