Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Anaerobe 71 (2021) 102420

Contents lists available at ScienceDirect

Anaerobe

journal homepage: www.elsevier.com/locate/anaerobe

Case Reports

Septic hip abscess due to Fusobacterium nucleatum and Actinomyces turicensis in an immunocompetent SARS-CoV-2 positive patient

A. Nia [a, e, *], A. Ungersboeck [a], M. Uffmann [b], D. Leaper [d], O. Assadian [c, d]

[a] Department of Orthopedic Surgery, Hospital Neunkirchen, Austria
[b] Department of Radiology, Hospital Neunkirchen, Austria
[c] Hospital Neunkirchen, Austria
[d] Institute for Skin Integrity and Infection Prevention, School of Human and Health Sciences, University of Huddersfield, UK
[e] Department of Traumatology and Orthopedics, Medical University of Vienna, Austria

ARTICLE INFO

Article history:
Received 11 December 2020
Received in revised form
22 July 2021
Accepted 23 July 2021
Available online 24 July 2021

Handling Editor: Ellie J.C. Goldstein

Keywords:
Fusobacterium nucleatum
Actinomyces turicensis
Septic hip abscess
SARS-CoV-2 positive

ABSTRACT

A 42-year-old man was referred to the Department of Orthopedic Surgery with pain over his right greater trochanter and signs of systemic infection. CT showed an enhanced mass in his gluteus maximus as well as gas in the biceps femoris over the underlying hip joint. Tissue biopsy yielded Fusobacterium nucleatum and Actinomyces turicensis. The patient was successfully treated for 6 weeks with amoxicillin/clavulanic acid 875mg/125mg and metronidazole 500mg.

1. Introduction

The majority of hip infections are caused by bacterial colonization. Viruses or fungi are accountable for just a few cases. Periprosthetic Joint infections are more common than infections of the native joint. Native joint infection occurs usually by hematogenous or lymphogenous seed of the pathogen. The most frequently detected pathogens of joint infections are staphylococci since these bacteria are virulent organisms [1]. Other gram-positive bacteria causing hip joint infections are streptococci, especially Streptococcus pyogenes, *Enterococcus faecalis*, and Corynebacteria species [2]. Actinomyces spp. are common inhabitants of the gut and genitourinary tract and Fusobacterium spp. are slow-growing anaerobic and gram-negative microorganisms that are part of the normal flora of the mouth and gastrointestinal tract [3,4]. Therefore, reported cases of infections caused by Fusobacterium spp. were mostly in the head and neck area and the underlying disease was chronic periodontitis or an odontogenic abscess [5]. A thorough literature search revealed only one other report of hip infection caused by Fusobacterium spp. This article describes a case of hip infection combined with muscle abscess caused by F. nucleatum and A. turicensis in an adult patient.

2. Case report

A 42-year-old man presented to the emergency department in July 2020, with pain over the right greater trochanter. Due to congenital oligophrenia, the patient was accompanied by his guardian as direct communication was impossible. The patient lived in a nursing home with daily supervision and support. The presentation was complicated and delayed by an ongoing Covid-19 outbreak in the nursing home with all patients living there being placed in official quarantine. Only after convincing the nursing staff about the importance of a medical examination, the patient was transferred to the hospital under enforced Covid-19 prevention measures, including the use of an FFP2 mask during transport and within the hospital. There was no history of joint aches or myalgias, no recent sexual contact. Anamnesis was negative for smoking, alcohol intake, or risk factors for acquired human

* Corresponding author. Department of Orthopedic Surgery Hospital Neunkirchen, Austria.
E-mail address: Arastoo.nia@hotmail.at (A. Nia).

https://doi.org/10.1016/j.anaerobe.2021.102420

immunodeficiency viruses. Other concomitant diagnoses included a history of pneumonia, dementia, and epilepsy. His body temperature was 37.0 °C with a history of recent fever associated with chills and sweats. Throat examination showed no exudate or erythema. Aural examination was normal and there was no lymphadenopathy, nor was there a heart murmur and abdominal examination was normal. After an initial examination by a general physician, consultative orthopedic support was requested. During orthopedic exploration, only pain over his right hip was noted.

Laboratory analysis showed an abnormal white blood count of 12.1 G/L (range: 4,0–10,0 G/L), elevated C-reactive protein of 30mg/L (range: normal <0,5mg/L), interleukin 6558.3 pg/ml (range: normal <10 pg/ml), hemoglobin 7.7g/dl (range: 14–18 g/dl), fibrinogen 6.1g/L (range: 1,8 und 3,5 g/L), ferritin 1,858ng/ml (range: 1,8–36,0 ng/ml), and albumin 26.9g/L (range: 34–48 g/L).

All other laboratory parameters, including urea and electrolytes, were within normal ranges. A SARS-CoV-2 specific polymerase chain reaction (PCR) test confirmed SARS-CoV-2 Infection.

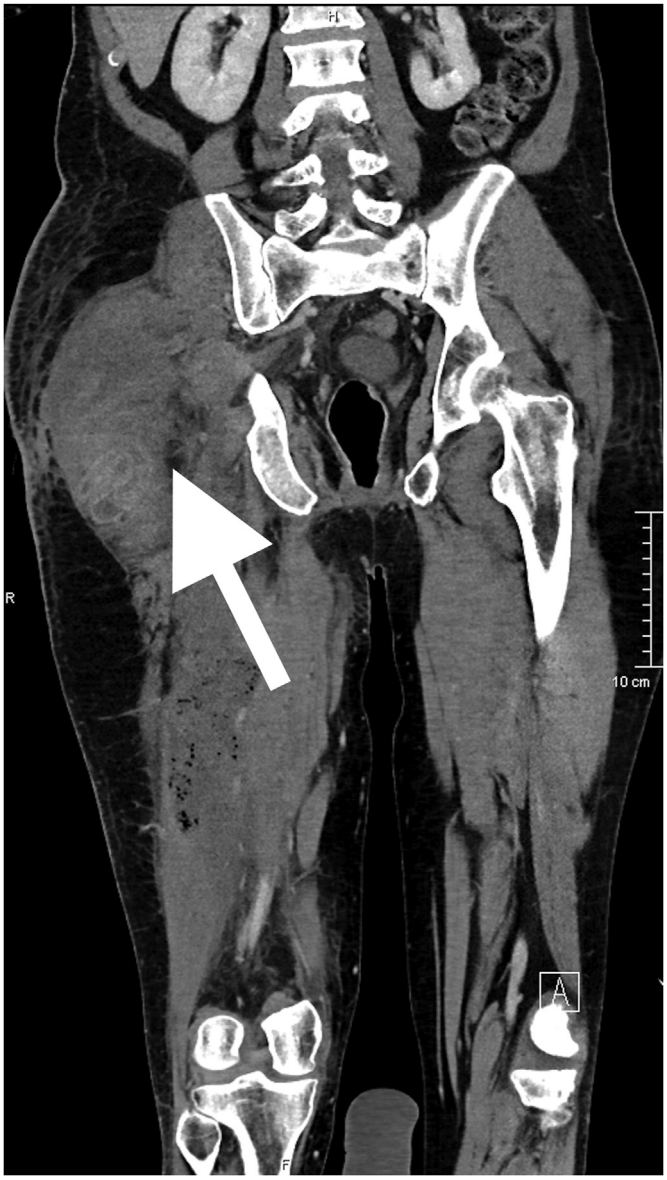

Fig. 1. Computer tomography imaging of the pelvis demonstrating abscess related contrast media enhancement of the gluteus muscle. Tissue gas within the quadriceps compartment.

Computed tomography (CT) of the pelvis showed an enhanced mass in the gluteus maximus as well as gas in the biceps femoris over the underlying hip joint (Figs. 1 and 2). Surgery was undertaken on the day of admission. A biopsy was extracted during surgery for conventional microbiological aerobic and anaerobic cultures. The empiric antimicrobial therapy was started intraoperatively with intravenous Ampicillin/Sulbactam 875mg/125mg, Fosfomycin 8g, and Metronidazole 1,500mg every 24h and he was transferred to the Intermediate Care Unit postoperatively.

During surgery, synovial fluid and joint tissues on the acetabulum and around the femoral neck were sampled for aerobic and anaerobic bacterial culture and histopathological examination. F. nucleatum and A. turicensis were isolated from three of seven intraoperative specimens. Bacteria were identified by MALDI-TOF MS (Vitek 2 ID, knowledge database version 2.0, bioMérieux, France) [6]. The microorganism was not identified into subspecies level. Minimal inhibitory concentrations (MICs) were determined by the E-test procedure (bioMérieux, France) on Mueller-Hinton Fastidious agar plates (Oxoid, UK), incubated at 35 °C in an anaerobic atmosphere for 24–48 h. The isolates were susceptible to penicillin, piperacillin-tazobactam, vancomycin, and metronidazole.

As a matter of fact, due to his mental disability, the patient removed his intravenous catheter repeatedly after 5 days of intravenous administration of antibiotics, therefore the antibiotic therapy had to be changed to oral amoxicillin/clavulanate 875mg/125mg and metronidazole 500mg twice daily for 2 weeks, followed by 6 weeks oral antibiotic therapy at his nursing home.

Clinically, the patient improved significantly after 9 days in the hospital, without any evidence of fever, hematuria, or abdominal pain. C-reactive protein decreased to 4.3 mg/L, and the white blood count was 8.84 G/L. Debridement had to be performed twice, at 10 days and 47 days, as a wound-healing disorder occurred. Biopsies and cultures of the final intervention showed negative bacteriological findings.

At 5-months follow-up, the patient's inflammatory markers returned to normal values, and the infection resolved clinically. He

Fig. 2. Computer tomography imaging of the right hip demonstrating tissue gas within the gluteus maximus muscle.

did not suffer any hip sequelae and remains clinical well. A nasopharyngeal swab tested for SARS-CoV-2 using rRT-PCR was negative on day 10.

3. Discussion

The incidence of infection with Fusobacterium spp. in the population reported by Afra et al. is 0.55/10,000/year and the majority of the Fusobacterium bacteremia cultured were F. nucleatum (61%). Intra-abdominal infection (26%) and active hematologic disorders (18%) were the most commonly reported primary diagnoses at the time of F. nucleatum bacteremia [7]. Fusobacterium spp. can be found in the mouth of humans and they are a natural part of the microbiota at these sites [8]. However, as they have been frequently isolated from other tissues in clinical samples during active disease, they are regarded as opportunistic pathogens and F. nucleatum shows an increasing number of connections to extraoral diseases [8]. Recent direct sequencing studies describe that F. nucleatum mechanistically influences colorectal tumorigenesis. The authors suggest that intratumoral F. nucleatum strains have an oral origin, as patients who harbor F. nucleatum in their tumors also have oral F. nucleatum strains that share matching arbitrarily primed PCR strain-typing patterns [8].

3.1. Fusobacterium nucleatum

Joint infections caused by F. nucleatum are not often described in literature. A search within the PubMed database with the following terms was initiated: “Fusobacterium” and “hip joint infection”. Additional cases were identified by analyzing the references of each report. Prosthetic joint infections were excluded. Only one documented septic arthritis of the hip due to Fusobacterium nucleatum in an otherwise healthy adult patient could be found [9].

Abscesses can occur at other sites including the knee joint, hip joint, liver, and submandibular gland [10]. There is only a small number of cases with Fusobacterium spp. infection caused by pyomyositis. The case of a 34-yr-old man presenting with pyomyositis, in whom F. nucleatum was isolated from the left quadriceps muscle has to be highlighted [11].

There was no history of any abdominal intervention in our patient, nevertheless, an intra-abdominal fistula may have been present which may have facilitated the spread of infection. This specific case is similar to a patient who presented with vertebral osteomyelitis possibly due to intra-abdominal fistula and F. nucleatum [12].

Fusobacterium spp. are sensitive to antibiotics including penicillin, metronidazole, and clindamycin [13], but there is a rising resistance in some Fusobacterium isolates [5]. Our patient received amongst other antibiotics parenteral penicillin as empiric treatment and this therapy was maintained successfully. Current literature supports the use of penicillin in orthopedic patients with invasive Fusobacterium infections together with debridement to prevent possible abscess formations. Delayed therapy is associated with significant higher mortality [10,14].

3.2. Actinomyces turicensis

Actinomyces spp. s are facultative anaerobic Gram-positive bacilli [15] which are common inhabitants of the gut and genitourinary tract [16]. These organisms are normally present in healthy individuals and should be considered opportunistic pathogens. Abdominopelvic actinomycosis can manifest as fistula, inflammatory pseudotumor, or abscess formation [17]. Searching the literature for “hip joint infections” and “Actinomyces spp.” and excluding prosthetic joint showed the following case: Hip arthritis with involvement of Actinomyces israelii [18]. However, an additional review of the literature without excluding prosthesis revealed more cases, where Actinomyces species caused prosthetic joint infection [19]. Drug resistance is not considered a problem in actinomycosis, therefore penicillin G or amoxicillin are considered first-line drugs for the treatment of actinomycosis together with surgical debridement of abscesses [20].

3.3. Covid19

Considering the restricted emergency room visits during the ongoing Covid-19 pandemic, our case highlights the possibility of delays in treatment for non-Covid-19 conditions such as infections, heart attack, and stroke. Due to the current rising numbers of Covid-19 infections globally patients with acute and chronic disease are less likely to attend facilities because of the fear of contracting Covid-19. There is a need to continue to provide adequate health care and to encourage individuals to continue visiting healthcare facilities even amid the Covid-19 pandemic [21].

4. Conclusion

There are only a few cases of joint infections due to Actinomyces and Fusobacterium species reported in the literature and till now this is the second hip infection of an adult patient caused by F. nucleatum in the literature. In case of joint infections with signs of bacteremia, early surgical intervention with debridement and adequate antibiotic therapy according to antimicrobial susceptibility should be considered.

Author Contributions

Conceptualization, A.N. and O.A..; methodology, A.N.; validation, M.U., A.U. investigation, M.J and M.S.; writing—original draft preparation, A.N..; writing— O.A, A.N. D.L.; visualization, M.U.; supervision, O.A.;

Declarations

All authors have read and agreed to the published version of the manuscript.

Funding

None.

Conflicts of interest/Competing interests

None.

References

[1] R. Nair, M.L. Schweizer, N. Singh, Septic arthritis and prosthetic joint infections in older adults, Infect. Dis. Clin. 31 (2017) 715–729, https://doi.org/10.1016/J.IDC.2017.07.013.
[2] U. Geipel, Pathogenic organisms in hip joint infections, Int. J. Med. Sci. 6 (2009) 234, https://doi.org/10.7150/IJMS.6.234.
[3] J. Li, Y. Li, Y. Zhou, C. Wang, B. Wu, J. Wan, Actinomyces and alimentary tract diseases: a review of its biological functions and pathology, BioMed Res. Int. 2018 (2018), https://doi.org/10.1155/2018/3820215.
[4] A. Noor, S. Khetarpal, Anaerobic infections, Lab. Diagnosis Bact. Infect. (2021) 705–746. https://www.ncbi.nlm.nih.gov/books/NBK482349/. (Accessed 19 July 2021).
[5] M.J. Lee, Y.E. Ha, H.Y. Park, J.H. Lee, Y.J. Lee, K.S. Sung, C.I. Kang, D.R. Chung, J.H. Song, K.R. Peck, Osteomyelitis of a long bone due to Fusobacterium nucleatum and Actinomyces meyeri in an immunocompetent adult: a case report and literature review, BMC Infect. Dis. 12 (2012) 1–4, https://doi.org/10.1186/1471-2334-12-161.
[6] O. Garner, A. Mochon, J. Branda, C.A. Burnham, M. Bythrow, M. Ferraro,

C. Ginocchio, R. Jennemann, R. Manji, G.W. Procop, S. Richter, J. Rychert, L. Sercia, L. Westblade, M. Lewinski, Multi-centre evaluation of mass spectrometric identification of anaerobic bacteria using the VITEK® MS system, Clin. Microbiol. Infect. 20 (2014) 335–339, https://doi.org/10.1111/1469-0691.12317.

[7] K. Afra, K. Laupland, J. Leal, T. Lloyd, D. Gregson, Incidence, risk factors, and outcomes of Fusobacterium species bacteremia, BMC Infect. Dis. 13 (2013) 264, https://doi.org/10.1186/1471-2334-13-264.

[8] C.A. Brennan, W.S. Garrett, Fusobacterium nucleatum — symbiont, opportunist and oncobacterium, Nat. Rev. Microbiol. 17 (2019) 156, https://doi.org/10.1038/S41579-018-0129-6.

[9] A.-M. Chryssagi, C.B. Brusselmans, J.J. Rombouts, Septic arthritis of the hip due to fusobacterium nucleatum, 20 (2014, Clin. Rheumatol. 203 (2001) 229–231, https://doi.org/10.1007/S100670170072.

[10] M.C. Pickering, T. Barkham, J.C. Mason, S. Shaunak, K.A. Davies, Bilateral gluteal abscesses as a unique manifestation of Fusobacterium septicaemia, Rheumatology 39 (2000) 224–225, https://doi.org/10.1093/rheumatology/39.2.224.

[11] M.A. Gonzalez-Gay, A. Sanchez-Andrade, M.J. Cereijo, J.R. Pulpeiro, V. Armesto, Pyomyositis and septic arthritis from Fusobacterium nucleatum in a non-immunocompromised adult, J. Rheumatol. 20 (1993) 518–520. https://europepmc.org/article/med/8478862. (Accessed 19 October 2020).

[12] A. Ramos, E. Berbari, P. Huddleston, Diagnosis and treatment of fusobacterium nucleatum discitis and vertebral osteomyelitis: case report and review of the literature, Spine (2013) 38, https://doi.org/10.1097/BRS.0b013e31827b4d61.

[13] M.D. Rowland, V.E. Del Bene, J.W. Lewis, Factors affecting antimicrobial susceptibility of Fusobacterium species, J. Clin. Microbiol. 25 (1987) 476–479, https://doi.org/10.1128/jcm.25.3.476-479.1987.

[14] G.C. Stahlman, D.K. DeBoer, N.E. Green, Fusobacterium osteomyelitis and pyarthrosis: a classic case of Lemierre's syndrome, J. Pediatr. Orthop. 16 (1996) 529–532, https://doi.org/10.1097/00004694-199607000-00022.

[15] E. Könönen, W.G. Wade, Actinomyces and related organisms in human infections, Clin. Microbiol. Rev. 28 (2015) 419–442, https://doi.org/10.1128/CMR.00100-14.

[16] V. Hall, Actinomyces-Gathering evidence of human colonization and infection, Anaerobe 14 (2008) 1–7, https://doi.org/10.1016/j.anaerobe.2007.12.001.

[17] C. Triantopoulou, A. Van der Molen, A.C. Van Es, M. Giannila, Abdominopelvic actinomycosis: spectrum of imaging findings and common mimickers, Acta Radiol. Short Reports 3 (2014), 204798161452457, https://doi.org/10.1177/2047981614524570.

[18] Saleem MA; Ul Abideen Z; Kiani IS; Yousaf A; Rasheed A; Shabbir RW., Sporadic actinomycosis of the hip complicated by Central Nervous System infection, J. Pakistan Med. Assoc.. PMID: 2842 (n.d.) 637-640.

[19] S.N. Redmond, R. Helms, A. Pensiero, A case of Actinomyces prosthetic hip infection, Cureus 12 (2020), https://doi.org/10.7759/CUREUS.9148.

[20] K.M. Balbinot, N.W.A. Sousa, J. de J.V. Pinheiro, A.L.R. Ribeiro, Surgical debridement as a treatment strategy for cervicofacial actinomycosis—literature review and case report, Int. J. Surg. Case Rep. 73 (2020) 22, https://doi.org/10.1016/J.IJSCR.2020.06.079.

[21] A.B. Hogan, B.L. Jewell, E. Sherrard-Smith, J.F. Vesga, O.J. Watson, C. Whittaker, A. Hamlet, J.A. Smith, P. Winskill, R. Verity, M. Baguelin, J.A. Lees, L.K. Whittles, K.E.C. Ainslie, S. Bhatt, A. Boonyasiri, N.F. Brazeau, L. Cattarino, L.V. Cooper, H. Coupland, G. Cuomo-Dannenburg, A. Dighe, B.A. Djaafara, C.A. Donnelly, J.W. Eaton, S.L. van Elsland, R.G. FitzJohn, H. Fu, K.A.M. Gaythorpe, W. Green, D.J. Haw, S. Hayes, W. Hinsley, N. Imai, D.J. Laydon, T.D. Mangal, T.A. Mellan, S. Mishra, G. Nedjati-Gilani, K.V. Parag, H.A. Thompson, H.J.T. Unwin, M.A.C. Vollmer, C.E. Walters, H. Wang, Y. Wang, X. Xi, N.M. Ferguson, L.C. Okell, T.S. Churcher, N. Arinaminpathy, A.C. Ghani, P.G.T. Walker, T.B. Hallett, Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: a modelling study, Lancet Glob. Heal. 8 (2020) e1132–e1141, https://doi.org/10.1016/S2214-109X(20)30288-6.