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Case Report

Case report: *Staphylococcus pseudintermedius* causing cryptogenic Liver abscess in a previously healthy pediatric patient

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ABSTRACT

Staphylococcus pseudintermedius (MRSP) is primarily a canine pathogen, rarely associated with human infections. Despite direct contact, the transmission of such canine pathogens to humans is difficult to explain. A pyogenic Liver abscess (PLA) is an important but relatively uncommon disease in children. We describe PLA in a previously healthy paediatric patient, without any history of dog exposure or other canine exposure, due to MRSP. The patient was treated successfully with Linezolid and discharged after becoming afebrile and pain-free. During two months follow up the patient remained normal.

1. Introduction

Pediatric Liver abscesses are not a common condition. Many a time the patient does not present with classical symptoms like fever, pain, and tenderness in the right hypochondriac region and signs of jaundice.

About half of the patients with pyogenic liver abscess present with fever and pain in the right upper quadrant.

The majority (about 80 %) of pediatric Liver abscesses are pyogenic (caused by bacterial infection) and only rarely (about 20 %) are amoebic liver abscesses. *Staphylococcus aureus* is the most common cause of pediatric pyogenic liver abscesses worldwide.

Some coagulase-positive *Staphylococcus* species, other than human pathogens, mostly associated with animals, have been demonstrated. One such emerging Coagulase positive *Staphylococcus* — *Staphylococcus pseudintermedius*, a member of the *Staphylococcus intermedius* group (SIG) is an important emerging human pathogen. *Staph. pseudintermedius* is a significant canine pathogen. We present a case of cryptogenic pediatric liver abscess caused by Methicillin-resistant *Staphylococcus pseudintermedius*.

2. Case Study

A 7 years old male patient presented in OPD with complaints of mild upper respiratory infection with fever and pain in the right hypochondriac region for fifteen days. The patient was initially treated at some other clinic. His abdominal discomfort and pain had slightly increased. Considering the lassitude, fever, and abdominal pain the patient was admitted for observation, and he was advised some laboratory as well as radiological investigations. Blood investigations included Complete Blood Counts, C-Reactive Protein, ESR, and Renal and Liver Function Tests [Table 1]. The Renal function tests were normal and the hepatic function tests did not show much change except slight raise Ultrasound of the Liver showed an absce measuring approx. $53 \times 39 \times 43$ mm in sub-hepatic location [Figure 2]. The hepatic abscess had undergone liquefaction. CT-guided percutaneous drainage of the abscess was done. The aspirate was sent to the Microbiology laboratory for culture and sensitivity and wet film preparation to rule out

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the possibility of Amoebic hepatic abscess.

The aspirate from the abscess revealed Gram-positive cocci in clusters suggestive of *Staphylococci spp*. *Staphylococci* appeared smaller than *Staphylococcus aureus* that we usually see [Figure 1] and so we were expecting it to be some other *Staphylococcal strain*. The colonies on Sheep blood agar were hemolytic, catalase -positive, the tube coagulase was positive. It was a mannitol non-fermenter. The bacterium was identified as *taphylococcus pseudintermedius* by VITEK 2 automated system and was Methicillin-Resistant (MRSP) and other AST mentioned in [Figure 3]. The patient was empirically treated with intravenous Ceftriaxone and metronidazole. The antibiotic regime was then changed to Linezolid after the identification and susceptibility was received. By 4th day, the patient became afebrile and the pain had reduced. On day 7th, the patient was discharged after he became pain-free. During two months follow-up, the patient remained asymptomatic and did not have a relapse.

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2.1. Investigations

Shown in the Table 1 blood investigations revealed raised total wbc count with neutrophilia and raised c-reactive protein levels. The transaminase and alkaline phosphatase was also raised.

The investigations reveal normalaization of wbc count and c-reactive proteins post treatemnt. Ultrasonography showed liquefaction of abscess sized approx. 53 × 39 × 43 mm in subhepatic location. [Figure 2] was containing about 47 cc of pus.CT abdomen showed a partially liquefied abscess in the right sub-diaphragmatic region and right dome of the diagram.

2.2. Differential diagnosis

Paediatrics Liver abscesses (PLAs) are uncommon. They have been reported to be seen in immunocompromised individuals. There are few case reports in which PLAs have been reported in healthy paediatric individuals. The etiological agents most commonly reported are *Staphylococcus aureus*, Klebsiella pneumonia, *Mycobacterium tuberculosis*, and *Entamoeba histolytica*. We, first time, report a paediatric liver abscess due to *Staphylococcus pseudintermedius* (Methicillin-resistant), a primarily canine pathogen causing cryptogenic Liver abscess as we could not trace the patient's possible exposure to Dog or any other canine.

Vitek 2 can identify Staph pseudintermedius with excellent correlation with other molecular technique. The Identification with probability of 96% or more is considered excellent.

While going through the literature we found that *S. psudintermedius* may be miss identified as *S. aureus* by

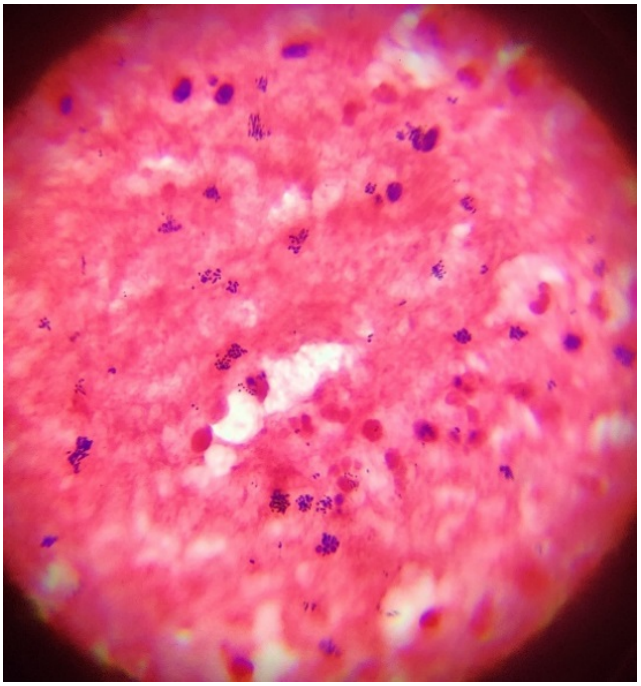

Figure 1: Gram-stained smear showing pus cells with Gram positive cocci in clusters.

Figure 2: USG of abdomen showing liver abscess sized approx. 53 × 39 × 43 mm in subhepatic location was containing about 47 cc of pus

manual techniques but not the other way round.

The list of biochemical tests for identification of *S.pseudintermedius* is attached herewith. [Figure 4]

While MALDI-TOF MS (Vitek MS, Biomereux) can discriminate between *S. aureus* and the *S. intermedius* group, it is unable to discriminate between *S. intermedius* and S. pseudintermedius, instead providing a split identification of *S. intermedius/pseudintermedius* (SIP).[1]

Organism Quantity:
Selected Organism : Staphylococcus pseudintermedius

Source: PUS **Collected:**

Comments:	Please Check for new intermediate interpretive catagory introduced by CLSI 2020 that states the names of drugs which has the potential to concentrate at any anatomical site, urine or epithelial lining

Identification Information	**Analysis Time:**	5.87 hours	**Status:**	Final
Selected Organism	96% Probability **Bionumber:**	**Staphylococcus pseudintermedius** 070402077723231		
ID Analysis Messages				

Susceptibility Information	**Analysis Time:**	8.55 hours	**Status:**	Final

Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation
Benzylpenicillin	>= 0.5	R	Linezolid	4	S
Oxacillin	0.5	*R	Daptomycin	1	S
Gentamicin	<= 0.5	S	Teicoplanin	<= 0.5	S
Ciprofloxacin	>= 8	R	Vancomycin	1	S
Levofloxacin	>= 8	R	Tetracycline	<= 1	S
Inducible Clindamycin Resistance	NEG	-	Tigecycline	<= 0.12	S
Erythromycin	<= 0.25	S	Rifampicin	<= 0.03	S
Clindamycin	0.25	S	Trimethoprim/ Sulfamethoxazole	>= 320	R

Figure 3: AST report

Table 1:

Test	Pre-treatment Results	Post treatment Results	Units	Biological reference
Hb	9.1	9.9	g/dl	12-15
Total count	14470	8940	/cmm	4000-10000
platelets count	678000	783000	/μl	150000-450000
CRP	79.6	4.8	mg/l	Less than 6
ESR	32.0	26	mm at l hr	3-12 after 1 hour
Total protein	7.3	7.0	g/dl	6.0 – 8.3
Albumin	3.0	3.8	g/dl	3.5-5.2
Globulin	4.3	3.2	g/dl	2-3.5
A/G ratio	0.7	1.19		0.8-2
ALP	982	-	IU/L	up to 780
ALT	31	-	IU/L	5 – 40

2.3. Treatment

The patient was initially treated with Ceftriaxone and Metronidazole with no significant benefit. The Antibiotic then was changed to Linezolid for 7 days. Followed by Clindamycin for 10 days to prevent relapse.

2.4. Outcome and follow up

The patient recovered completely and during two months follow up the patient remained afebrile and asymptomatic. The patient did not have a relapse.

2.5. Discussion

Paediatric Liver abscesses are not a common condition. Many a time the patient does not present with classical

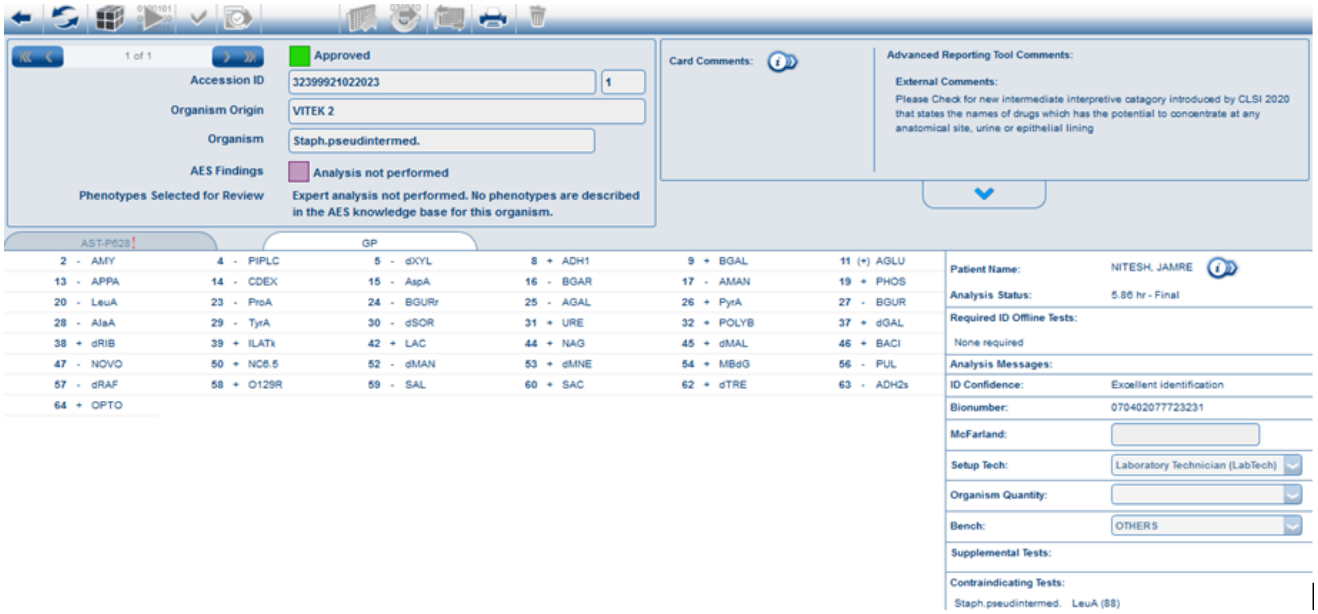

Figure 4: Identification of *S.pseudintermedius* by VITEK 2 Compact

symptoms like fever, pain, and tenderness in the right hypochondriac region and signs of jaundice. About half of the patients with pyogenic liver abscess present with fever and pain in the right upper quadrant.[2,3] The majority (about 80%) of paediatric Liver abscesses are pyogenic (caused by bacterial infection) and only rarely (about 20%) are amoebic liver abscesses.[4] *Staphylococcus aureus* is the most common cause of paediatric pyogenic liver abscesses worldwide.[5,6] However *Klebsiella pneumoniae* is frequently an isolated pathogen in cases of paediatric as well as adult pyogenic Liver abscesses in Taiwan.[7,8] While in central Taiwan Streptococcus spp. is isolated as a secondary pathogen.The pathogenesis of the development of pyogenic Liver abscess involves bacterial entry into the liver via the biliary tract or by the hematogenous route. Appendicitis was once considered a major associated condition with pyogenic Liver Abscess.[7] Pathogen entry into the liver sinusoids via portal circulation results in the development of Liver abscess.[4,7] Rarely other conditions like cholangitis, trauma, systemic bacterial sepsis, and ventriculoperitoneal shunt could lead to PLA. Whenever the pathogenic mechanism of PLA was not clear they were considered as cryptogenic origin.[7] Diagnostic percutaneous tap to drain the liver abscess remains the mainstay in finding out the right etiology for targeted treatment. Early diagnosis may help in early recovery and shortening of antibiotic therapy. It serves a role in antibiotic stewardship to prevent usage of unnecessary antibiotic usage. Historically *Staphylococci* that can elaborate, an enzyme, coagulase (Staphylo-coagulase), or express it on the cell surface are considered more pathogenic than those who do not possess this ability. Some coagulase-positive Staphylococcus species, other than human pathogens, mostly associated with animals, have been demonstrated. One such emerging Coagulase positive Staphylococcus — *Staphylococcus pseudintermedius*, a member of the Staphylococcus intermedius group (SIG) is an important emerging human pathogen. *Staphylococcus pseudintermedius* is a significant canine pathogen. Despite direct contact, the transmission of such canine pathogens to humans is difficult to explain.[9]

The significance of identification of *Staphylococcus pseudintermedius* and *Staphylococcus aureus* is because of the difference in their oxacillin resistance break-points.[10] As CLSI has redefined the break-points in 2016 for *S.pseudintermedius* (oxacillin susceptible, <0.5 μg/ml; oxacillin resistant, ≥1 μg/ml) and for S.aureus and S.lugdunensis (oxacillin susceptible, ≤2 μg/ml; oxacillin resistant, ≥4 μg/ml).[11,12] It was also mentioned that screening for methicillin resistance of *S.pseudintermedius* should be done using only Oxacillin MIC or disk diffusion zone of inhibition as Cefoxitin salt agar used for S.aureus is not sensitive for detection of mec-A mediated methicillin resistance in S.psuedintermedius (MRSP).[13] We present a case of cryptogenic paediatric liver abscess caused by Methicillin-resistant *Staphylococcus pseudintermedius*. *Staphylococcus pseudintermedius* is primarily a canine pathogen. It has been isolated in the past from different superficial and systemic infections. The transmission from canine to human is difficult to explain in the absence of any demonstrable canine, especially dog, exposure. The route of entry, the primary site of colonization and pathogenesis to the development of liver abscess is difficult in such cases.In conclusion, we report *Staphylococcus pseudintermedius* as the cause of Liver abscess for the first time. The diagnostic

percutaneous aspiration served us in detecting the pathogen and opting for targeted antibiotic therapy.

3. Conclusion

Paediatric patients with Pyogenic Liver Abscesses may not present with typical symptoms. PLA should be suspected in patients with fever and right upper chondral pain. The radiological investigation followed by percutaneous drainage is important in the management of PLA. Proper Identification of bacterial species with the susceptibility pattern is a mainstay in the successful treatment of PLA.

4. Patient Consent

Patient Consent Duly filled consent form is taken.

5. Source of Funding

None.

6. Conflict of Interest

None.

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