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Case Report

Ventriculoperitoneal shunt associated meningitis caused by Globicatella sanguinis: Review of an emerging human pathogen

Sharin Varma[1], Smriti Srivastav[1], Aparna Ningombam[2], Deepak Gupta[3], Purva Mathur[2]*

[1]*Dept. of Microbiology, Jai Prakash Narayan Apex Trauma Centre, All India institute of Medical Science, New Delhi, India*
[2]*Dept. of Laboratory Medicine, Jai Prakash Narayan Apex Trauma centre, All India institute of Medical Science, New Delhi, India*
[3]*Dept. of Neurosurgery, Jai Prakash Narayan Apex Trauma Centre, All India institute of Medical Science, New Delhi, India*

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ABSTRACT

The genus Globicatella has two species sanguinis and sulfidifaciens. Globicatella sanguinis is an unusual and rare pathogen causing bacteraemia, meningitis, and urinary tract infection in humans. The epidemiology and clinical significance of this pathogen remain largely unkown as Globicatella spp. are rarely isolated from clinical samples. We present a case of 36 year old male who had VP shunt associated meningitis caused by this pathogen. After the extensive literature search till date, we believe that this is the first case of VP shunt associated meningitis in a post trauma patient due to this pathogen. The identification of Globicatella sanguinis was made by Vitek 2 systems and was further confirmed by MALDI-TOF MS. Antibiotic Susceptibility Testing was performed by both Vitek 2 and Kirby bauer disc diffusion method according to CLSI standards for streptococcus spp. Its role as a human pathogen still remains only partially known because of the trouble involved in identification and the small number of reports pertaining to Globicatella. Furthermore, it has been demonstrated that Globicatella spp. are commensal organisms in humans which makes it even more difficult to eatablish it as a cause of disease.

1. Introduction

The genus Globicatella has two species sanguinis and sulfidifaciens. Globicatella sanguinis is an unusual and rare pathogen causing bacteraemia, meningitis, and urinary tract infection in humans.[1,2] Several unidentified streptococcus-like clinical isolates were characterised in the USA in 1992 and G. sanguinis was first described as a new genus and species of catalase-negative, facultatively anaerobic, non-motile, alpha-hemolytic, Gram-positive cocci (GPC) forming short chains or pairs by Whitman, et al.[3] This organism has also been isolated from animals with a report of G. sanguinis isolated from a lamb with meningoencephalitis in Spain.[4] The other species, G.sulfidifaciens was first described in 2001, with documented isolation only from animals. It has a 99.2% similarity in 16S rRNA gene sequencing to G. sanguinis, but is different in biochemical reaction.[5] Due to its colonial morphology, this pathogen could be readily misidentified with Streptococcus pneumoniae or viridans streptococci [7] leading to an underestimation of Globicatella infections. The epidemiology and clinical significance of this pathogen remain largely unkown as Globicatella spp. are rarely isolated from clinical samples.

* *Corresponding author*.
E-mail address: purvamathur@yahoo.co.in (P. Mathur).

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2. Case Report

We present a case of a 36 yr old male patient who suffered a RTA back in 2013. Left Frontotemporoparietal decompression and craniectomy was done. The post traumatic hydrocephalus was managed by placement of a V.P shunt followed by cranioplasty. He was discharged with a healthy shunt and advised for routine treatment and physiotherapy. In May 2022, he was again admitted with an episode of seizure and chest wall abscess for which Incision and drainage was undertaken. Eventually he was discharged with antibiotic coverage (Tab Augmentin and clindamycin). In June 2022 he presented again to the emergency with pus discharge from the shunt tract, vomiting and fever. His vitals were stable, Glassgow coma scale-Eye opening-4, Verbal -5, Motor-6, Pulse Rate-72bpm, Respiratory Rate-16/min, Blood Pressure-130/80mm/Hg. Local examination revealed left chest wall sinus indurated with active CSF leak with pus flakes. There was no history of loss of consciousness or ENT bleed. As the shunt was infected a shunt exteriorisation was planned with external ventricular drainage and a provisional diagnosis of shunt associated meningitis was made. The patient was started on empirical antibiotics. (Injection amikacin and cefoperazone -sulbactam) but the patient continued having spikes of fever.

Figure 1: Blood agar plate showing alpha-hemolytic colonies of Globicatella sanguinis

A lumbar puncture was performed and CSF sent for culture. The CSF sample was subcultured on blood agar, chocolate agar and MacConkey agar. There was no growth in the MacConkey agar. The blood and chocolate agar both showed a faint growth of tiny rough alpha haemolytic colonies after overnight incubation (24hrs) at 37^0C with 5% CO2.(Figure 1) These colonies became more pronounced after 48 hrs of incubation. The colonies were catalase negative and yielded gram-positive cocci in chains on gram stain. Theses colonies were identified as Globicatella sanguinis by Vitek 2 systems and was further confirmed by MALDI-TOF MS. Antibiotic Susceptibility Testing was performed by both Vitek 2 and Kirby bauer disc diffusion method according to CLSI standards for streptococcus spp. The isolate was found to be sensitive only to Vancomycin and Linezolid and resistant to Penicillin, Ampicillin, Cefotaxime, Ceftriaxone, Levofloxacin and Clindamycin. The patient was started on Linezolid and showed a subsidence of fever and resolving of symptoms. Prior to shunt replacement, a CSF was sent again for culture which came out to be sterile. After negative CSF culture, a definitive ventriculoperitoneal shunt was implanted.

3. Discussion

A search of all the case reports of human infections due to this pathogen in all published medical literature available on PubMed and Google Scholar (all years until July 2022) was done, and all references were retrieved and reviewed.

The entire published clinical experience with Globicatella infections (50 cases) is summarized in theTable 1.

As seen from the above table this pathogen as causative agent of infection has been documented since about 50 years. There are about 50 cases reported with this infection. This infection showed a female preponderance with 33 (73%) females and 12 (27%) males. Maximum number of cases were found in the extremes of age-group. There were 9 (27.5%) cases in the age group of 80-90 years followed by 8 (20%) cases in the 0 -10 years age group. Maximum cases were reported from U.S.A (n=25) followed by Canada. Three cases were reported each from Denmark, Germany and India. Out of the reported 50 cases, maximum isolation was from blood samples (n=33, 58%) followed by CSF (n=9, 18%). Most of the cases were associated with clearing of the infection, only 2 cases died. One was a 5-month-old baby with an underlying condition of posterior fossa tumour and the other was a 80 year female who had chronic diarrhoea and was a known case of diabetes mellites. Identification was done in maximum cases by Rapid ID 32 Strep (n=27, 64%). 8 cases were diagnosed by 16 S r RNA sequencing, 5 cases were diagnosed by MALDI-TOF.

Though its role as a human pathogen is confirmed, it still remains only partially known because of the trouble involved in identification and the small number of reports pertaining to Globicatella. Furthermore, it has been demonstrated that Globicatella spp. are commensal organisms in humans which makes it even more difficult to eatablish it as a cause of disease.[6]

Table 1: The entire published clinical experience with Globicatella infections (50 cases) is summarized

Year of publication	Place	Reference number	Author	Gender	Patient age	Underlying condition	Site of isolation	Identification	Treatment	Outcome
1994 – 2000	US - 22 Canada - 5	7	Shewmaker	M - 6 F - 17 NA - 4	0-3 yrs - 5 25-50 yrs - 2 50-75 yrs - 3 75+ yrs – 8 NA - 9	NA	Blood - 21 CSF – 2 Urine - 4	Rapid ID 32 strep - 27	NA	NA
2006	Taiwan	1	Lau sk	F	80	Chronic diarrhoea, Diabetes Mellitus	Blood	16S rRNA sequencing	NA	Death
2006	Taiwan	1	Lau sk	F	92	Dementia, Chronic heart faliure	Blood	16S rRNA sequencing	CXM.CAZ	Alive
2007	Denmark	8	Abdul-Redha	F	23	Intravenous drug use, Right-sided endocarditis, Hepatitis C	Blood	Rapid ID 32 strep, partial 16S rRNA sequencing	CXM, PN	Alive
2007	Denmark	8	Abdul-Redha	F	56	Alzheimer's disease, Hypertension	Blood	Rapid ID 32 strep, partial 16S rRNA sequencing	PN	Alive
2007	Denmark	8	Abdul-Redha	M	82	Crohn's disease, Atrial fibrillation	Blood	Rapid ID 32 strep, partial 16S rRNA sequencing	CXM	Alive
2007	Germany	9	Seegmuller	F	69	VP Shunt	CSF	Rapid ID 32 strep, Phoenix pmic/id-56	CTRX	Alive
2010	France	6	Hery-Arnaud	F	56	NA	CSF	16S rRNA sequencing	CTX, FOS	Alive
2012	India	2	Jain N	M	70	Craniectomy	CSF	Vitek 2	VA, LEVO	Alive
2012	Japan	10	Matsunami	M	94	Dementia, CHF, Nephrolithiasis	Blood	16S rRNA sequencing	A/S, VA	Alive
2012	NA	11	Aseefa S	M	63	Mixed myelodysplastic and myeloproliferative disease, Chronic renal insufficiency, Obstructive uropathy with B/L ureteral stent	CSF	NA	NA	NA

Continued on next page

Table 1 continued

2016	Korea	[12]	hs yang	M	85	Parkinson's disease, Asthma, Hypertension, staying at nursing home	Blood	Partial 16S rRNA sequencing	VA, CTRX	Alive
2016	Assam, India	[13]	Devi U	F	2 D	None	CSF	16S rRNA sequencies	CLOXACILLIN AK	Alive
2016	Japan	[14]	s kurogi	F	80	Colon cancer, Brain stroke, Dementia, Hypertension	Urine	16S rRNA sequencing	A\S	Alive
2017	New York	[15]	Miller AO	F	72	Obesity, Gastric lap banding, Tobacco	Hip synovium	Partial 16S rRNA Sequencing, MALDI-TOF-MS	VA	Alive
2017	New York	[15]	Miller AO	F	54	Obesity, Diabetes Mellitus, Gastric bypass, Tobacco	Blood	MALDI-TOF-MS	LZ	Alive
2017	Turkey	[16]	Atkas E	F	43	Diabetic nephropathy on hemodialysis- femoral cathteter infection	Blood	16S rDNA sequencing	VA	Alive
2018	Japan	[17]	Takahasi	F	87	Endocarditis following UTI	Blood	Rapid ID 32 Strep,16S rRNA sequencing	AMPICILLIN	Alive
2018	Korea	[18]	Ahn K	F	76	Hypertension and Degenerative arthritis	Blood	16 S rRNA sequencing	VA AND LEVO	Alive
2018	New York	[19]	S,sangli	F	64	Hypertension and Proctocolitis	Blood	Vitek	BROAD APECTRUM ANTIBIOTICS	Alive
2019	Turkey	[20]	Hasbek	F	39	Lumboperitoneal shunt	CSF	Maldi biotyper 2.3, 16 S rDNA sequence analysis	NA	NA
2022	Morocco	[21]	Skali H	F	5 M	Posterior fossa tumor	CSF	MALDI-TOF -MS	NA	Death
2022	India	[22]	Gupta B	M	9	Corneal abscess and Endophthalmitis	Pus	MALDITOF-MS and VITEK 2	NA	NA
2022	Burkina faso	[23]	Kabore	NA	NA	3 Acute cellulitis 1 Chronic cellulitis 1Apical periodonitis	Pus	API 20 strep gallery (biomérieux, france)	NA	NA

CHF: chronic heart failure; CSF: cerebrospinal fluid; VA: vancomycin; CTRX: ceftriaxone; LZ: linezolid; CXM: cefuroxime; CAZ: ceftazidime; PN: penicillin; A/S: ampicillin/sulbactam; CTX: cefotaxime; FOS: fosfomycin; LEVO: levofloxacin; CPZ/S: cefoperazone-sulbactam; AK, amikacin

Despite the similarity Globicatella has with other Gram positives, a few distinct differentiating characters exist, such as cellular arrangement of the cells in the Gram stain, Globicatella forms chains while the aerococci form tetrads and clusters. Biochemical tests that can help in identification of this pathogen include negative leucine aminopeptidase reaction (LAP) and growth in the presence of 6.5% NaCl. The viridans streptococci are pyrridonylarylamidase (PYR) negative and LAP positive and do not grow in the presence of 6.5% NaCl. Susceptibility to the third-generation cephalosporins is also different: G. sanguinis is resistant while group A streptococcus is susceptible.[7]

After the extensive literature search till date, we believe that this is the first case of VP shunt associated meningitis in a post trauma patient due to this pathogen. See gmuller and coulleges also presented a similar case of VP shunt associated meningitis due to this rare pathogen but the patient had no history of trauma and the shunt was placed to manage a decompensated hydrocephalus.[9] The second case had meningitis due to infection in the lumbo peritoneal shunt on day 10 th of hospitalisation.[20]

16S rRNA gene sequencing continues to be the best tool in the characterisation of rarely encountered bacteria and defining their clinical significance. But, in most of the clinical laboratory, MALDI-TOF has emerged as a useful tool. The mass spectrometry has the potential of being an accurate tool for catalase negative gram-positive cocci identification even for species with difficult diagnosis.[24]

With the increasing number of device implementations, medical procedures and increased survival length of patients living with advanced grades of immunosuppression, more case reports with rare pathogens have come to light. Therefore, increasing the diagnostic power of clinical microbiology laboratories by molecular methods and renewal of the databases of commercial identification systems are proving to be of utmost importance for control of infections caused by such rare pathogens.

4. Conclusion

Due to scarcity of literature, the epidemiology and the clinical significance of this pathogen remains largely unknown. Due to greater numbers of isolation of this rare species, the clinicians understanding about its clinical significance and antibiotic susceptibility also needs to be expanded.

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None.

6. Conflict of Interest

None.

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Author's biography

Sharin Varma, Senior Resident

Smriti Srivastav, Senior Resdient

Aparna Ningombam, Assistant Professor

Deepak Gupta, Professor

Purva Mathur, Professor

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