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ASSESSMENT OF MICROBIAL PROFILE IN PATIENTS WHO DEVELOPED EARLY AND LATE SURGICAL SITE INFECTIONS FOLLOWING CORTICAL MASTOIDECTOMY.

Otolaryngology

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ABSTRACT

OBJECTIVE-To investigate the microbial profile that can cause early and late surgical site infections (SSI's) in those who underwent cortical mastoidectomy in order to facilitate prevention and morbidities associated with the same. **METHODS-** It's a clinical audit (observational study). Case records of 40 patients who developed secondary infection were evaluated and divided into two groups. Group A, patient who developed early SSI's i.e, within 1 month following surgery and group B, those who developed late SSI's i.e, after 1 month following surgery. **RESULTS-** Total of 200 cases who underwent cortical mastoidectomy during Jan 2016-jan 2019; 40 patients developed secondary infections following cortical mastoidectomy were included in the study, 14(35%) patients developed early SSI's and were categorized into group A. 26 (65%) patients developed late SSI's were categorized into group B. Most commonly isolated organism in both groups pre and postoperatively was Pseudomonas species followed by Staphylococcus and persistence of microbe pre and post operatively in both groups was identified as Pseudomonas. **CONCLUSION-** Pseudomonas aeruginosa was found to be the most common bacterial isolate in patients with SSI's following cortical mastoidectomy. It was also found, pseudomonas as most common microbial isolate preoperatively also results in persistence of disease post-surgery (both in Early and Late SSI's). Staphylococcus aureus was the second most common bacterial isolate and the commonest gram positive isolate found in the ear swabs both preoperatively and postoperatively. Thus this datas highlights the need for a specific SSI surveillance and to check for other parameters like immunological status of the patient in otological surgeries.

KEYWORDS

Secondary Infection; Cortical Mastoidectomy; Post Operative Bacteriology;pseudomonas.

AIM:- To analyze the microbes that can cause early and late surgical site infections(SSI's) and predictors of SSI's in those who underwent cortical mastoidectomy

INTRODUCTION:-

Chronic Suppurative otitis media (CSOM) results from the chronic inflammation of the middle ear cleft which leads to osteitis and irreversible mucosal changes and requires surgical disease clearance. It has been believed that mastoidectomy is an effective procedure that has better outcome for the control of chronic middle ear infection. [1]

Cortical mastoidectomy is the most widely done surgery for chronic discharging ear. Retro auricular approach is routinely performed as it allows wide access to the tympanic membrane, middle ear cleft and mastoid.[2]

Surgical site infections(SSI's) are the most common nosocomial infections, which accounts for 10% of ear surgeries especially in dirty and contaminated procedure, and those who developing surgical site infection have an extended hospital stay and increase morbidities and may requires revision surgery.[3] Prompt diagnosis and early initiation of treatment can reduce the incidence of postoperative infection, can substantially decrease morbidity and thus reduces the economic burden of the patient.[4] One of the most important step in the management of chronic middle ear infections is to know the bacterial etiology, so that appropriate antimicrobial treatment can be promptly directed.[5] Studies have proven that Pseudomonas aeroginosa and Staphylococcus aureus were the most common bacterial isolates in patients with persistent ear discharge. It has been proven that patient with Pseudomonas had more resistance to antimicrobials than Staphylococcus. [6] Patient infected with pseudomonas infection preoperatively, are predisposed to re-infection post-surgery compared to other patients. [7]

Periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates are necessary to decrease the potential risk of complications. [8]

We therefore analyzed the microbes that can cause early and late surgical site infections (SSI) and predictors of SSI's in those who underwent cortical mastoidectomy.

MATERIAL AND METHODS:-This study was performed in the Department of ENT and Head and neck in a tertiary care Centre for a period of 3 years from Jan 2016-Jan 2019.This study was approved by ethics committee and informed consent were taken.

STUDY TYPE:-Clinical audit (Observational study).

Case records of 200 patients who underwent cortical mastoidectomy from the period of January 2016 to January 2019 were taken and those who developed secondary infections were separated and included in the study. Those case records were then divided into two groups. Group A-Early SSI, patient who developed infections within 1 month following surgery and group B-Late SSI, those who developed infections after 1 month following surgery. This division was made according to the definition of SSI as per Centers for Disease Control and Prevention (CDC). According to the definition criteria of SSI any inflammation of the retro auricular scar, retro auricular purulent discharge, purulent otorrhoea or otitis media post-surgery can be included. SSI were defined as "early SSI" if occurring within 30 days after surgery or as "late SSI" if occurring thereafter. [9,10]

Inclusion criteria: All patients who had developed surgical site infection following cortical mastoidectomy with a retroauricular approach (for management of chronic otitis media with or without complications).

Exclusion criteria: Patients who underwent mastoidectomy as an approach for other surgeries like cochlear implantation, Facial nerve decompression, Canal wall down mastoidectomy, labrynthectomy and translabrynthine CP angle tumor excision, history of previous head and neck radiotherapy were excluded. Patients with comorbidities like uncontrolled diabetes and other systemic illness were also excluded.

SPECIMEN COLLECTION:-

Using a sterile aural speculum, under otomicroscopic vision and under aseptic precautions swabs (it can be pus, discharge or granulations)

were collected from deep external auditory canal and were sent to microbiology central laboratory for processing within 30 minutes. Once the reports are released after 2-3 days, patients were changed to antibiotics according to the susceptibility. All patients then were treated preoperatively, intraoperatively and postoperatively with IV antibiotics according to culture and sensitivity and antibiotic protocol followed in our institution. The most common isolated organism from both the groups were identified and statistically analyzed by chi-square test and the presence of same organism preoperatively and post operatively was also noted and statistically analyzed between two groups.

RESULTS:

Out of 200 cases forty patients respected the inclusion criteria's were enrolled in the study and whose case records were evaluated and divided them into two groups; 40 patients developed secondary infections following cortical mastoidectomy during the specified period .Out of forty patients, 14(35%) patients were male and 26(65%) patient were female with a mean age of (37±14). Onset of infection was divided into two groups. Out of forty patient those who developed secondary infection, 14(35%) patients developed infection within one month of post-operative period (Early SSI's) and were categorized into group A. 26 (65%) patients developed infection after one month post-surgery (Late SSI's) and were categorized into group B as in table I.

Table I. Onset Of Infection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 1 MONTH (GROUP A)	14	35.0	35.0	35.0
	> 1 MONTHS (GROUP B)	26	65.0	65.0	100.0
	Total	40	100.0	100.0	

The mode of presentation in both groups was identified. Out of 14 patients in group A, 5 (19%) patients had mucopurulent otorrhoea and 9(64%) patients had scar inflammation. Out of 26 patients in group B, 21(80%) patients had mucopurulent otorrhoea and only 5(35%) patients had scar inflammation. The distribution is given in table II.

Table II. Mode Of Presentation

		Onset Of Infection		Total=40
		< 1 Month Group A	> 1 Months Group B	
Mode Of Presentation	Mucopurulent Ottorea	5	21	26
		19.2%	80.8%	100.0%
	Postaural Scar Inflammation	9	5	14
		64.3%	35.7%	100.0%
Total		14	26	40
		35.0%	65.0%	100.0%

Post operatively it was noted that in group A out of 14 patients 8 cases, Pseudomonas was found to be the most common organism isolated with a percentage of 57.1%. and in group B out of 26 patient 8 cases were isolated with pseudomonas with a percentage of 30.7%.In case of staphylococcus it was noted that in group A, out of 14 cases only 1 case (7%) was isolated and in group B, out of 26 cases 7 cases(26.9%) were isolated. Out of these organisms, the most common organisms isolated were Pseudomonas species in both the cases. Thus in both groups the most common organism isolated were pseudomonas spp. Details given in Table III.

Table:III Organism isolates postoperatively

		ONSET OF INFECTION		Total
	TYPE OF ORGANISM ISOLATES	<1 MONTH-Group A	> 1 MONTHS-Group B	
	ASPERGILLUS FUMIGATUS	0	2	2
		.0%	100.0%	100.0%
	CANDIDA TROPICALIS	0	2	2
		.0%	100.0%	100.0%
	ENTEROCOCCUS FECALIS	1	1	2
		50.0%	50.0%	100.0%
	KLEBSIELLA PNEUMONIA	0	1	1
		.0%	100.0%	100.0%
	MORGANELLA	1	0	1
		100.0%	.0%	100.0%
	NO GROWTH	1	2	3
		33.3%	66.7%	100.0%
	PROTEUS MIRABILIS	1	3	4
		25.0%	75.0%	100.0%
	PSEUDOMONAS AEUROGINOSA	8	8	16
		50.0%	50.0%	100.0%
	STAPHYLOCOCCUS AUREUS	1	7	8
		12.5%	87.5%	100.0%
	STREPTOCOCCUS SPECIES	1	0	1
		100.0%	.0%	100.0%
Total		14	26	40
		35.0%	65.0%	100.0%

Preoperatively out of 14 patients in group A, 7 (50%) patients was isolated Pseudomonas species, and 4 (28.57%) patients was isolated Staphylococcus species. In group B, 10 (71.42%) was isolated Pseudomonas species, and 6 (42.87%) was isolated Staphylococcus species. Details are given in table IV.

Table IV Organism isolates preoperatively

		ONSET OF INFECTION		Total
		GroupA	Group B	
Preoperative	Candidia	0	1	1
		.0%	100.0%	100.0%
	Enterococcus	1	1	2
		50.0%	50.0%	100.0%
	No Growth	0	3	3
		.0%	100.0%	100.0%
	Proteus Mirabilis	1	0	1
		100.0%	.0%	100.0%
	Pseudo Aeuroginosa	7	10	17
		41.2%	58.8%	100.0%
	Staphylococcus	4	6	10
		40.0%	60.0%	100.0%
	Streptococcus	1	5	6
		16.7%	83.3%	100.0%
Total		26	40	

In Group A, 7 patients who were identified pseudomonas spp. preoperatively, of which 6 patients (85%) showed pseudomonas growth postoperatively. In one patient with enterococcus growth preoperatively, it changed to Pseudomonas auroginosa in the postoperative period. For Staphylococcus out of 4 patients identified preoperatively, from which only 1 (25%) patient identified same Staphylococcus species postoperatively. In Group B, total of 10 patients those who have preoperative swab reported as pseudomonas species, 6 patients (60%), showed pseudomonas postoperatively and 3 patients (30%) changed to streptococcus species. For staphylococcus out of 6 patients, changed to streptococcus species in 3 patient (50%).Table V

Table V ASSOCIATION OF PREOPERATIVE AND POST OPERATIVE MICROORGANISM

ONSET OF INFECTION	TYPE OF ORGAN ISM POST OP									Total
	Aspergillusfumigatus	CANDIDA TROPICALIS	ENTEROCOCCUS FECALIS	KLEBSIELLA PNEUMONIA	MORGANELLA	NO GROWTH	PROTEUS MIRABILIS	PSEUDO AEUROGINOSA	STAPH AUREUS	STREPTOCOCCUS	

Group A	PREOPERATIVE	ENTEROCOCCUS			0		0	0	0	1	0	0	1
					.0%		.0%	.0%	.0%	100.0%	.0%	.0%	100.0%
		PROTEUS MIRABILIS			0		0	0	1	0	0	0	1
					.0%		.0%	.0%	100.0%	.0%	.0%	.0%	100.0%
		PSEUDO AEUROGINOSA			0		0	1	0	6	0	0	7
					.0%		.0%	14.3%	.0%	85.7%	.0%	.0%	100.0%
		STAPHYLOCOCCUS			1		1	0	0	1	1	0	4
					25.0%		25%	.0%	.0%	25.0%	25.0%	.0%	100.0%
		STREPTOCOCCUS			0		0	0	0	0	0	1	1
					.0%		.0%	.0%	.0%	.0%	.0%	100.0%	100.0%
	Total			1		1	1	1	8	1	1	14	
				7.1%		7.1%	7.1%	7.1%	57.1%	7.1%	7.1%	100.0%	
Group B	PREOPERATIVE	CANDIDIA	1	0	0	0		0	0	0	0		1
			100.0%	.0%	.0%	.0%		.0%	.0%	.0%	.0%		100.0%
		ENTEROCOCCUS	0	0	0	0		0	1	0	0		1
			.0%	.0%	.0%	.0%		.0%	100.0%	.0%	.0%		100.0%
		NO GROWTH	1	2	0	0		0	0	0	0		3
			33.3%	66.7%	.0%	.0%		.0%	.0%	.0%	.0%		100.0%
		PSEUDO AEUROGINOSA	0	0	1	0		0	0	6	3		10
			.0%	.0%	10.0%	.0%		.0%	.0%	60.0%	30.0%		100.0%
		STAPHYLOCOCCUS	0	0	0	0		1	0	2	3		6
			.0%	.0%	.0%	.0%		16.7%	.0%	33.3%	50.0%		100.0%
		STREPTOCOCCUS	0	0	0	1		1	2	0	1		5
			.0%	.0%	.0%	20%		20.0%	40.0%	.0%	20.0%		100.0%
	Total		2	2	1	1		2	3	8	7		26
			7.7%	7.7%	3.8%	3.8%		7.7%	11.5%	30.8%	26.9%		100.0%

DISCUSSION:

Surgical site infection following cortical mastoidectomy with retro auricular approach was not uncommon. Even though it's a safe surgery. However the chances of reinfection which leads to unstable ear, i.e intermittent discharge and hearing loss. Our study showed that approximately 10% of the cases who underwent cortical mastoidectomy developed secondary infection. Similar finding was observed by *ahn JH et al.II.*[12] Surgical site infections are one of the major complications post operatively that causes financial burden, prolong hospital stays, discomfort to the patient. Our study showed that most patient who presented SSI's infection was in group B (Late SSI's) (65%).This is probably because of increased exposure and susceptibility to pathogens and also contamination of the normal middle ear and nasopharynx and from flora of the skin through EAC.[10] Study also showed that the use of preoperative antibiotics is found to be effective in the prevention of early surgical site infections, this explains the increase number of patients in group B.[13]

In our study the most common age group to have Chronic otitis media and who underwent surgery in the second decade. This is in agreement with v.k poorey et al and Baruah et al (1969), and Mishra et al (1997). The high incidence of this problem was due to frequent lack of effective treatment, nutritional deficiencies, overcrowding in primitive dwellings, poor sanitation, lack of hygiene and the general poverty. However jong ahn et al found that even for old patient who was diagnosed COM has an improved hearing and less complication following mastoidectomy.[14]

The most common indication for surgery was persistent ear discharge and those with active ear discharge because of multiple resistant bacteria or MRSA showed mastoidectomy provide better results as described by *T.mutoh et al.*[15,16] In our study 64% of the patient in group A presented with post aural scar inflammation and remaining have persistent discharge. In contrast approximately 80% patients had persistent otorrhoea in group B. Presence of early SSI's linked with inflammatory state of ear at the time of surgery and post aural scar inflammation might be because of the persistence of granulation tissue in the mastoid. Otorrhoea during the 6 months before surgery could be a marker of this chronic inflammation and is associated with late SSI onset. The same was explained by *bastier et al.*[10]

In our study the most common organism isolated preoperatively was Pseudomonas (43%) [4, 5, 8]. Second most common organism was Staphylococcus 25%. [13]

Even after proper preoperative antibiotic (as per pre-op culture and sensitivity) coverage, the development or persistence of same organism postoperatively is more with pseudomonas infection when compared to other organisms. It was noted that Pseudomonas as a cause of secondary infection was more common in both groups. After attachment pseudomonas produces enzymes like proteases, lipopolysaccharides thus escape from defence mechanism of body probably explains the persistence of pseudomonas post mastoidectomy, even though removed all granulation tissue from the mastoid [6, 8, 13].

In our study we found most of the organisms isolated preoperatively are sensitive to ciprofloxacin and most of the patient treated with the same followed by third generation cephalosporins like cefoperazone.

CONCLUSION

Pseudomonas aeruginosa was found to be the most common bacterial isolate in the ear swabs of patients who developed surgical site infections. Staphylococcus aureus was the second most common bacterial isolate and was the commonest gram positive isolate found in the ear swabs both preoperatively and postoperatively. Even though mastoidectomy produced significant results in patient with chronic discharging ear, we found that the association between organisms isolated upon preoperative middle ear swab culture and the incidence of postoperative otorrhea was higher in patients especially with pseudomonas species

Thus we conclude that patients with Pseudomonas infection preoperatively have an increased risk of persistent infection post-surgery and also have high resistance to antibiotics preoperatively and postoperatively. Thus this datas highlights the need for a specific SSI surveillance and to check for other parameters like immunological status of the patient in otological surgeries.

No potential conflict of interest between the authors.

REFERENCES

1. Verhoeff M, van der Veen EL, Rovers MM, et al. Chronic Suppurative otitis media: a review. *Int J Pediatr Otorhinolaryngol* 2006; 70:1-12.
2. Bidkar VG, Jalisatigi RR, Naik AS, et al. Perioperative only versus extended antimicrobial usage in tympanomastoid surgery: a randomized trial. *Laryngoscope* 2014; 124:1459-63.
3. Kirkland KB, Briggs JP, Trivette SL, et al. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. *Infect Control Hosp Epidemiol*. 1999 Nov; 20(11):725-30.
4. Vishwanath S, Mukhopadhyay C, Prakash R, Pillai S, Pujary K, Pujary P. Chronic Suppurative otitis media: optimizing initial antibiotic therapy in a tertiary care setup. *Indian J Otolaryngol Head Neck Surg*. 2012; 64(3):285-289.
5. Nandy A, Mully PS, Sivarajan K. Chronic Suppurative otitis media – A bacteriological study. *Indian J Otol* 1991; 43: 136-8.
6. HUSSAIN, Raj Tajamul et al. A study of microbial gamut and antibiograms in chronic Suppurative otitis media. *International Journal of Otorhinolaryngology and Head and Neck Surgery*, 2018 [S.l.], v.5, n.1, p.110-115.
7. Vartiainen E, Karjalainen S, Kärjä J. Postoperative evaluation of chronic otitis media caused by pseudomonas aeruginosa. *J Laryngol Otol*. 1986 Feb; 100 (2):141-4.
8. Al-Shara M. A Five-year Review on the Etiology and Antimicrobial Susceptibility Pattern of Otitis Media Pathogens in Jordanian Children. *Oman Med J*. 2012; 27(5):358-363.
9. Mangram, A. J., Horan, T. C., et al. Guideline for Prevention of Surgical Site Infection, 1999. *American Journal of Infection Control, 27(2), 97–134.*

10. Bastier PL, Leroyer C, Lashéras A, et al. Early and late surgical site infections in ear surgery. *Acta Otorhinolaryngologica Italica: Organo Ufficiale Della Societa Italiana di Otorinolaringologia e Chirurgia Cervico-facciale*. 2016 Apr; 36(2):127-134
11. Palva T, Hallstrom O. Bacteriology of chronic otitis media. Results of analyses from the ear canal and from the operative cavity. *Arch Otolaryngol* 1965; 82:359Y64.
12. Ahn JH, Kim MN, Suk YA, Moon BJ. Preoperative, intraoperative, and postoperative results of bacterial culture from patients with chronic Suppurative otitis media. *Otol Neurotol*. 2012 Jan; 33(1):54-9.
13. Pierce N, Antonelli PJ. Efficacy of Antibiotic Prophylaxis Prior to Tympanoplasty with Mastoidectomy for Contaminated Cholesteatoma. *Otolaryngology–Head and Neck Surgery*. 2014; 151(1_suppl):P83-P83.
14. Ahn JH, An YS, Bae JS et al. Postoperative results of tympanoplasty with mastoidectomy in elderly patients with chronic otitis media. *Ann Otol Rhinol Laryngol*. 2012 Mar; 121(3):168-73.
15. OJALA, K., SORRI, M. and RHHIKANGAS, P. (1981) Comparison of pre- and post-operative bacteriology of chronic ears. *Journal of Laryngology and Otology* 95: 1023-1029
16. Mutoh T, Adachi O, Tsuji K, Okunaka M, Sakagami M. Efficacy of mastoidectomy on MRSA-infected chronic otitis media with tympanic membrane perforation. *Auris Nasus Larynx*. 2007 Mar;34(1):9-13.