

**CLINICAL EVALUATION OF ZEPP'S AURAL
RESECTION AND VERTICAL EAR CANAL
ABLATION IN THE TREATMENT OF
CHRONIC OTITIS EXTERNA
IN DOGS**

By

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No part of the thesis has been submitted for any other degree or diploma. The published part has been fully acknowledged. All the assistance and help received during the course of investigation have been duly acknowledged by author of the thesis.

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TABLE OF CONTENTS

CHAPTER	TITLE	PAGE NO.
I	INTRODUCTION	
1		
II	REVIEW OF LITERATURE	3
2.1	INCIDENCE	3

2.1.1	Age	3
2.1.2	Sex	5
2.1.3	Breed	5
2.2	CLINICAL SIGNS	6
2.3	CLINICAL EXAMINATION OF PATIENT	6
2.4	CULTURAL EXAMINATION AND SENSITIVITY TESTING OF EAR DISCHARGE	8
2.5	MEDICAL TREATMENT	11
2.6	SURGICAL TREATMENT	14
2.6.1	Zepp's Aural Resection	14
2.6.2	Vertical Ear Canal Ablation	17
2.7	HISTOPATHOLOGY	21
2.8	COMPLICATIONS OF ZEPP'S AURAL RESECTION AND VERTICAL EAR CANAL ABLATION	23
III	MATERIALS AND METHODS	26
3.1	MATERIALS	26
3.2	DESIGN OF STUDY	26
3.3	METHODS	27
3.3.1	Incidence	27
3.3.2	Clinical Examination	27
3.3.2.1	Clinical Signs	27
3.3.2.2	Collection of Ear Swabs and Cultural Examination	27
3.4	MEDICAL EXAMINATION	28
3.5	SURGICAL TREATMENT	28
3.5.1	Zepp's Aural Resection	28
3.5.1.1	Preparation of Patients	28
3.5.1.2	Anaesthetic Procedure	30

3.5.1.3	Surgical Procedure for Zepp's Aural Resection	30
3.5.1.4	Post-operative Care	35
3.5.2	Vertical Ear Canal Ablation	35
3.5.2.1	Preparation of Patient and Anaesthesia	35
3.5.2.2	Surgical Procedure for Vertical Ear Canal Ablation	35
3.5.2.3	Post-operative Care	39
3.6	HISTOPATHOLOGICAL EXAMINATION	39
3.7	STATISTICAL ANALYSIS	44
IV	RESULTS	45
4.1	INCIDENCE	45
4.1.1	Age distribution	45
4.1.2	Breed distribution	45
4.1.3	Sex distribution	46
4.2	CLINICAL SIGNS	47
4.3	CULTURAL EXAMINATION OF EAR DISCHARGES	51
4.4	ANTIBIOTIC SENSITIVITY TEST	51
4.5	MEDICAL TREATMENT	52
4.6	SURGICAL TREATMENT	52
4.6.1	Zepp's Aural Resection	56
4.6.2	Vertical Ear Canal Ablation	56
4.7	HISTOPATHOLOGICAL EXAMINATION	58
V	DISCUSSION	67
5.1	INCIDENCE	68
5.2	CLINICAL SIGNS	69
5.3	CULTURAL EXAMINATION AND MEDICAL TREATMENT	70
5.4	SURGICAL TREATMENT	71
5.4.1	Zepp's Aural Resection	71
5.4.2	Vertical Ear Canal Ablation	72

5.5	HISTOPATHOLOGICAL EXAMINATION	73
5.6	CONCLUSION	73
VI	SUMMARY	75
	LITERATURE CITED	78

LIST OF FIGURES

Figure No.	Title	Page No
1	Zepp's aural resection- Forceps positioned into the vertical ear canal	31
2	Zepp's aural resection- Two parallel skin incisions were made and connected ventrally.	31
3	Zepp's aural resection- The lateral cartilaginous wall of the vertical ear canal was exposed.	32
4	Zepp's aural resection- Cutting the vertical ear canal	32

5	Zepp's aural resection- Reflecting the cartilaginous flap distally exposed the horizontal canal.	33
6.	Zepp's aural resection- Cartilage flap was resected for making the drainboard.	34
7	Zepp's aural resection- Suturing the drainboard.	34
8	Zepp's aural resection- Medial wall of the vertical ear canal was sutured to the skin.	36
9	Vertical ear canal ablation- 'T'- shaped skin incision was made.	37
10	Vertical ear canal ablation- Exposing the vertical canal after retracting the skin flaps.	37
11	Vertical ear canal ablation- The horizontal incision continuing through the cartilage around the external auditory meatus.	38
12	Vertical ear canal ablation- The entire vertical canal freed from the surrounding tissue.	40
13	Vertical ear canal ablation- Transecting the vertical canal close to the horizontal canal	40
14	Vertical ear canal ablation- Incising the vertical canal for making flaps	41
15	Vertical ear canal ablation- Showing the dorsal and ventral flaps of the vertical canal.	41
16	Vertical ear canal ablation- Ventral flap sutured to the skin for making drainboard.	42
17	Vertical ear canal ablation- The skin incision closed.	42
18	Vertical ear canal ablation with out baffle plate- Exposing the horizontal canal by transecting the ear canal at the junction of vertical canal with annular cartilage.	43
19	Vertical ear canal ablation without baffle plate- Closed the skin incision in a T – shaped manner.	43
20	Purulent discharges in a dog with chronic otitis externa.	48
21	Brown colour discharge in chronic otitis externa.	48
22	A case of chronic otitis externa showing blood discharges, hyperplasia, ulceration, and complete stenosis of ear canal.	49
23	Stenotic ear canal in a dog with chronic otitis externa	49
24	Maggot wound of external ear canal associated with chronic otitis externa.	50
25	Zepp's aural resection- Incisional dehiscence at ventral aspect of drainboard after removal of sutures – 10 th Post-operative day.	54
26	Zepp's aural resection- Normal healing of ear after suture removal – 10 th Post-operative day.	55

27	Zepp's aural resection- Appearance of opening of horizontal canal- 15 th Post-operative day.	55
28	Vertical ear canal ablation without baffle plate – Normal healing of ear after removal of sutures-10 th Post-operative day.	56
29	Vertical ear canal ablation with baffle plate- Incisional dehiscence of ear after suture removal- 10 th Post-operative day.	59
30	Vertical ear canal ablation with baffle plate- Normal healing of ear.	60
31	Microphotograph showing normal cartilaginous structure with Mild congestion, round cell infiltration and fibroblastic proliferation (H &E x 160).	62
	Microphotograph showing round cell infiltration in the dermal layers (H & E x 160).	62
33.	Microphotograph showing round cell infiltration with mild congestion and mild fibroblastic proliferation (H & E x 250)	63
34	Microphotograph showing extensive fibroblastic proliferation (H&E x 250)	63
35	Microphotograph showing attempted ossification with Inflammatory cells (H & E x 160)	64
36	Microphotograph showing proliferative chondrocytes (H&E x 160)	65
37	Microphotograph showing ceruminous glands and hair follicles (H & E x 160)	66
38	Microphotograph depicting hair follicles and sebaceous glands with secretions. (H & E x 160).	66

LIST OF TABLES

Table No.	Title	Page No.
1	Medical Treatment Regimen followed	29
2	The Breed distribution of the chronic otitis externa	46
3	Details showing sex wise incidence	
46		
4	Clinical signs of chronic otitis externa	47
5	Showing dogs with unilateral / bilateral disease	47
6	Type of bacteria isolated from ear discharge	
51		
7	Results of the antibiotic sensitivity test of the isolates from otitis externa cases	52
8	Clinical results of Zepp's aural resection in chronic otitis externa of dogs	57
9	Clinical results of vertical ear canal ablation in chronic otitis externa of dogs	61

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DECLARATION

I, Mr. **JAGAN MOHAN REDDY. K**, hereby declare that the thesis entitled, “**CLINICAL EVALUATION OF ZEPP’S AURAL RESECTION AND VERTICAL EAR CANAL ABLATION IN THE TREATMENT OF CHRONIC OTITIS EXTERNA IN DOGS** ” submitted to Acharya N. G. Ranga Agricultural University for the degree of **MASTER OF VETERINARY SCIENCE (SURGERY & RADIOLOGY)** is the result of the original research work done by me. It is further declared that the thesis or any part thereof has not been published earlier in any manner.

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ABSTRACT

The present clinical study was carried out on 88 dogs presented for treatment of chronic otitis externa. In 74 dogs (84.09%) medical treatment was performed and in the remaining 14 dogs surgical treatment was undertaken. Out of these 14 dogs, 7 dogs were treated by performing Zepp's aural resection and the remaining 7 dogs were treated by performing vertical ear canal ablation.

The mean age of presentation of dogs with otitis externa requiring medical treatment was found to be 5.21 ± 0.27 years. For surgical cases the mean age were found to be 7.07 ± 0.23 years.

The results revealed that a majority of cases of chronic otitis externa were noticed in German Shepherd followed by Spitz, Mongrels, Labrador, Doberman and Dachshund.

The various clinical signs of otitis externa were head shaking, scratching, pain odour, ear discharges and head tilt. Visual examination of ear canal revealed hyperplasia, thickening, ulceration, stenosis and calcification of ear canals in 14 cases. These cases were selected for surgical treatment. Out of 88 dogs examined 27 dogs had unilateral ear disease and 61 dogs had bilateral ear disease.

The results of cultural examination of the ear discharges resulted in isolation of *Staphylococcus* sp., in 51 cases, *Pseudomonas* in 24 cases and *E. coli* in 13 cases. Ciprofloxacin was found to be the most effective drug with 31 cases responding to the drug, followed by Gentamycin in 25 cases, Chloramphenicol in 22 cases, Amoxycillin in 6 cases and Oxytetracycline in 4 cases.

Medical treatment comprised of through irrigation of the external ear canal followed by topical and parenteral antibiotics as determined by antibiotic sensitivity test. Medical treatment of 74 dogs resulted in alleviation of symptoms in 62 (83.78%) dogs while six dogs had relapse of symptoms after 4-6 weeks. Treatment of these six dogs with the same treatment regimen led to recovery. Six dogs were not available for follow up.

All the seven dogs where Zepp's aural resection was performed recovered uneventfully. Wound dehiscence was observed in one case. All the dogs recovered without any post-operative complications.

All the seven dogs that had advanced chronic otitis externa with symptoms like hyperplasia and complete or partial stenosis of the ear canal were relieved from the clinical symptoms of otitis externa by performing vertical ear canal ablation. Barring one case of wound dehiscence, no complications were observed in any of the dogs.

Histopathological examination of the resected portions of the ear canal revealed the presence of severe cellular infiltration, congestion, extensive fibroblastic proliferation, and attempts of ossification.

CHAPTER I

INTRODUCTION

Otitis externa is a common disease in dogs, which is relatively resistant to medical treatment. Many cases in which medical treatment proves fruitless are, therefore, as a “last attempt” subjected to surgical treatment (Tufvesson, 1955). When medical treatment of chronic otitis externa fails, surgical intervention is necessary. The Zepp’s Procedure is a commonly used surgical technique but is not without some complications (Siemering, 1980). In stubborn cases of chronic otitis externa in dogs, lateral ear resection is often considered the first alternative following the failure of medical management. Most veterinary surgeons use a modified version of the technique described by Zepp’s (Gregory and Vasseur, 1983).

In general veterinary practice, dogs and cats with recurrent otitis externa are frequently seen and in the majority of chronic cases the ear canal is irreversibly damaged and medical treatment no longer effective (Tirgari and Pinniger, 1986). Chronic otitis externa is common in dogs, accounting for approximately 10% of admissions to small animal clinics (Devitt et.al., 1997).

Several surgical procedures have been described for cases where the otitis externa is not responsive to medical management. Of these, lateral or vertical ear canal resections are simple procedures in dogs and cats. Both are used to help treat relapsing otitis externa or neoplastic disease of the external ear canal (Bellah, 1997). A resection of the lateral wall of the vertical ear canal (Zepp's operation) is used for treatment of diseased ears that are not end stage. The procedure involves removal of the lateral wall of the vertical ear canal causing the horizontal canal to open directly to the environment. The purpose of the procedure is to alter the microenvironment by improving the drainage and allowing for better aeration in the horizontal canal (Sylvestre, 1998). On the other hand, vertical ear canal ablation results in excision of the infected inflamed tissue and is also thought to obviate certain complications associated with Zepp's aural resection (Siemering, 1980).

Most of the published literature pertains to work done abroad and although ear disease is seen by the practicing veterinarians, there is very little information on the surgical treatment of chronic otitis externa in dogs in India. Therefore, the need for the present clinical evaluation of Zepp's aural resection and vertical ear canal ablation in chronic otitis externa in dogs. In addition, the information generated by studies on clinical cases is not only scarce but are clinically very relevant for improvement of small animal clinical practice.

Hence, the present clinical evaluation of Zepp's aural resection and vertical ear canal ablation in the treatment of chronic otitis externa in dogs was taken up with the following objectives.

1. To diagnose and select clinical cases suitable for Zepp's aural resection and vertical ear canal ablation in dogs.
2. To treat chronic cases of otitis externa by Zepp's aural resection and vertical ear canal ablation.
3. To compare the efficacy of the Zepp's aural resection and vertical ear canal ablation in the treatment of chronic otitis externa in dogs

CHAPTER II

REVIEW OF LITERATURE

2.1 INCIDENCE

Grono (1980) reported that one in eight dogs attending the Small Animal Practice Teaching Unit at the Edinburgh Veterinary School was clinically affected with otitis externa.

Baba.et.al., (1981), while studying the incidence of otitis externa in dogs in Japan observed that about 6.3 percent of the dogs admitted to the animal hospital suffered with ear affections.

Bellah (1997) stated that in 1981 Griffin reported that otitis externa is a frequent problem in small animals that accounts for 4% of veterinary hospital admissions.

2.1.1 Age

Tufvesson (1955) observed that Airedale Terriers were amply represented at 5 to 8 years of age where the risk of the otitis externa seemed to be greater, the spitz breed was represented by many dogs over 10 years old, where the risks appeared to be slighter. When Spaniels and Dachshunds were compared to each other, it was seen that these breeds were fairly equally represented in two age groups in question, but very unequally from the viewpoint of disposition.

Grono and Frost (1969) stated that otitis externa in dogs is noticed most frequently between 5-8 years of age. They attributed this to the peak development of co-factors such as allergic conditions and keratinization disorders such as seborrhea, which were presumed to occur commonly at this age.

Sharma and Rhoades (1975) encountered otitis externa more commonly in dogs of one to four years of age.

Little et.al.,(1991) studied chronic otitis in relation to age of the affected dog. Out of 42 dogs studied, 2 (4.6%) were of 2 to 4 years, 12 (28.5%) were of 4 to 6 years, 7 (17.0%) dogs ranged between 6 to 8 years, 8 (18.4%) dogs were between 8 to 10 years and only 3 (7.2%) were above 10 years.

Devaya (1993) observed insignificant association between the age and occurrence of ear infection in dogs, although a high incidence was noticed in dogs between 3 to 6 years (43.40%) followed by those dogs aged more than six years (32.08%). 24.53% of the dogs were under 3 years of age.

Bellah (1997) stated that in 1995 Johnston observed that in dogs with life long recurring otitis externa the symptoms manifested first at 12 to 18 months of age.

2.1.2 Sex

While Tufvesson (1955) found no statistically significant sex disposition of the chronic otitis, Grono and Frost (1969) reported higher prevalence of chronic otitis in males than in females.

Little et.al., (1991) reported that out of 42 dogs suffering with ear disease, 26 (61.6%) were males and remaining 16 (38.4%) were females.

Devaya (1993) in his epidemiological studies on ear infection in dogs observed no variation in incidence of the disease in either sex.

2.1.3 Breed

Tufvesson (1955) reported that certain breeds such as the Spaniels, Poodle and Airedale Terrier are especially predisposed to the otitis externa, while Dachshunds, mongrels and possibly Spitz dogs and Collies are more resistant.

Grono and Frost (1969) found highest incidence of otitis externa in Cocker Spaniel (11.5%) followed by Labrador (6.5%), Miniature Poodle (7.0%), Dachshund (4.5%) and German shepherd (3.6%).

Lane and Little (1986) reported that higher incidence of chronic otorrhoea and underlying otitis media was found in German shepherd (40%).

Little et.al., (1991) reported that among the 42 dogs studied with ear diseases, 12 (28.5%) were German Shepherds, 8 (19.0%) were Spaniels, 4 (9.5%) were Retrievers (including Labrador) and 18 (42.8%) belonged to various other breeds.

2.2 CLINICAL SIGNS

Grono (1980) observed that the cardinal signs of otitis were erythema, increased discharge, pain and pruritus.

Bojrab and Renegar (1981) reported that head shaking and rubbing and or scratching of the affected ear are commonly seen in otitis externa.

Tirgari and Pinniger (1986) selected for surgery those cases in which medical treatment proved to be unsuccessful. These included irreversible tissue changes involving the pinna and the entire vertical canal caused by neoplasia, suppurative otitis, chronic ulceration, hyperplasia and narrowing or stenosis of the vertical auditory canal.

Krahwinkel (1993) reported that clinical signs of otitis externa may be pruritus, manifested by scratching, rubbing the ears, shaking the head, and mild erythema of the ear canal. The animal becomes head shy and exhibits pain when examined. Aural exudate becomes prominent, varying from dry, brown exudates of *Otodectes cyanotis* to purulent, smelly exudates of bacterial infection.

Uchida et.al.,(1994) observed that itching, pinna erythema, debris, swelling, ulcers and exudates are the major clinical signs of chronic otitis.

2.3 CLINICAL EXAMINATION OF PATIENT

Fraser et.al., (1970) and Lane (1982) studied the integrity of the tympanic membrane which was established by otoscopy or palpation with a blunt spreull needle under general anaesthesia.

Douglas and Williamson (1980) observed the radiographs of the petrous temporal bones by taking the ventrodorsal and open mouth projections.

Harvey (1980) reported that a thorough ear examination requires anaesthesia or deep sedation so that the dog does not shake its head in response to the noise resulting from use of a suction canula next to its eardrum.

Little and Lane (1989) experimentally evaluated three techniques for the assessment of the integrity of the canine tympanic membrane viz., tympanometry, otoscopy and palpation by a blunt probe. Otoscopic examination was shown to be moderately accurate under controlled conditions. However, under field conditions when otitis externa was present, visual inspection of tympanic membrane was seldom possible and the palpation of the tympanic membrane with a blunt probe was shown to be inaccurate and led to rupture of the membrane in a high proportion of cases.

Boothe (1990) reported that careful examination of the tympanum is usually possible only with the dog under general anaesthesia. Careful otoscopic examination may reveal a perforation, but it can be difficult to confirm a tear. Gently probing the tympanum using a small blunt-tipped instrument may also help confirm perforations with direct visualization.

Devaya (1993) carried out physical examination of all the infected ears to note the clinical signs, type of exudates and odor of the ear discharge. Otoscopic

examination was performed on individual patients to observe the condition of ear canal and tympanic membrane following thorough ear cleaning and removal of ear discharge. In dogs with ruptured tympanic membrane, a blunt probe was gently passed to ascertain the rupture.

Little (1996) reported that radiography can play a useful part in the assessment of cats and dogs with known or suspected aural disease, particularly where it is chronic or is failing to respond to therapy.

Bellah (1997) suggested that a thorough physical examination must be performed followed by cytology and culture and sensitivity testing in animals with suspected ear problems.

2.4 CULTURAL EXAMINATION AND SENSITIVITY TESTING OF EAR DISCHARGE

Wilter (1949) isolated *Micrococcus pyogenes* var *aureus* as the prevailing etiological agent in cases of purulent otitis externa.

Farrang and Mahmoud (1953) while investigating otorrhoea in dogs found a high incidence of *Pseudomonas aeruginosa* infection

Fraser (1965) stated that Gram-negative organisms were very rarely isolated in dogs with normal ear but most frequently isolated in cases of chronic otitis externa or in recurrent ear diseases.

Baxter and Lawler (1972) studied the incidence and microbiology of otitis externa of dogs and cats in New Zealand and reported that the yeast *Pityrosporus pachydermatis* was the most frequently involved organism. Among

the other isolates, *Pseudomonas*, *Proteus* and *Staphylococcus aureus* were the most noticeable.

Wang (1972) studied cultures of 182 ears with otitis externa from 100 dogs, which yielded 158 *Staphylococcus aureus*, 43 *Proteus mausei*, 32 *Pseudomonas aeruginosa*, 28 Haemolytic Streptococci, 19 *Enterococcus* sp., and 17 *Candida tropicalis*.

Krogh et.al.,(1975) examined culturally the ear swabs from 609 dogs with different types of ear infections. The commonest organisms involved were Staphylococci or Yeast in 29 % samples. Pure Yeast infection was found in 19 % and pure Staphylococcal infection in 16 % of cases. *Pseudomonas aeruginosa* and *Proteus microbilis* was found in 7 % of the cases. No organisms could be isolated from 22 percent of the cases.

Sharma and Rhoades (1975) studied the microbiology of otitis externa and found *Pityrosporus pachydermatis* the frequently involved organisms followed by *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Blue and Wooley (1977), following a bacteriological survey in 323 dogs with otitis externa found that *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Proteus* sp., were the most common isolates.

Lund (1979) cultured 130 swabs from Otitis externa cases and isolated *Staphylococcus aureus* from 30.4 % of cases, *Pseudomonas aeruginosa* from 18.3 % and fungi from 9.6 % of cases. *Proteus* sp., *Escherchia* sp., *Streptococci* sp., and *Micrococcus* sp., were also isolated from the rest of the cases.

Harvey (1980) reported that bacteriologic culture and sensitivity testing are useful, particularly if the infection is well-established or unresponsive to treatment.

Baba et.al., (1981) while studying the incidence of otitis externa in dogs and cats in Japan reported the prevalence of bacteria in the following order: Staphylococcus (54.0%) , Streptococcus (11%) , E.coli(10%) , Pseudomonas (8%) , Yeast (8%), Gram-positive rods (10%) and Gram-negative rods(4%).

Dickson and Love (1983) studied 31 dogs with clinical signs of ear irritation along with 26 asymptomatic dogs and reported that very small number of bacteria and Yeast could be recovered from asymptomatic dogs, while Pseudomonas and Proteus sp., were frequently isolated from dogs with chronic ear irritation.

Akay et.al., (1984) examined ear swabs from 33 dogs with otitis which resulted in the isolation of Pseudomonas aeruginosa from 9 (27%), Staphylococcus aureus from 6 (18%) , Proteus microbilis from 4 (12%) , E.coli from 3 (9%) and Corynebacterium pyogenes , Enterobacter and Anthracoids from one case each.

Dakshinker et.al.,(1992) conducted bacteriological examination of Otitis externa cases in canines and reported that Staphylococcus aureus was the most frequent isolate (23.93% cases) followed by Pseudomonas aeruginosa (22.22% cases) and Staphylococcus epidermis (14.81%cases). 14.81 % of the isolates remained unidentified. Other bacteria isolated included Streptococci, Proteus, E.coli and Klebsiella.

Devaya (1993) isolated bacteria such as *Pseudomonas* sp., Coagulase positive *Staphylococcus* sp., *Escherichia* sp., *Proteus* sp., Beta hemolytic *Streptococcus* sp., *Bacillus* sp., and *Klebsiella* sp., from the cases of otitis in dogs.

Tondon (1996) reported that ear infection in canines was primarily caused by *Streptococcus*, *Staphylococcus*, *Pseudomonas* and fungal agents. Yeasts were found to be secondary invaders in most canine ear infections.

Bellah (1997) suggested that in animals with suspected ear problems, a thorough physical examination must be performed followed by a cytology and culture and sensitivity testing. On the basis of test results, he recommended appropriate, consistent medical treatment before considering adjunctive surgical intervention.

2.5 MEDICAL TREATMENT

Fraser (1961) found a combination of Chloramphenicol and Dapsone to be most effective in ear infections.

Ehinger (1976) used Sofan (preparation containing DMSO, Dexamethasone acetate, Neomycin, Olendomycin and Polymyxin-B) in the treatment of otitis externa in 16 dogs and of them, 14 responded well to the treatment.

Algoet (1979) reported satisfactory results in 88 dogs having acute and chronic otitis when treated with preparation containing Neomycin, Polymyxin-B and Dexamethasone and Monosulfurom in Dimethyl Sulphoxide.

Harvey (1980) reported that the three antibiotics particularly useful for treating severe bacterial ear infections (especially *Proteus* and *Pseudomonas* sp.) are Gentamycin, Cyprimyxin and Chloramphenicol. It was also reported that a Thiabendazole-Dexamethasone-Neomycin combination is the treatment of choice for mite (*Otodectes cynotis*) infestation.

Baba et.al.,(1981) reported that based on the antibacterial susceptibility of bacteria isolated from otitis externa in dogs, the first choice of antibiotic for the mixed infection was Gentamycin followed by Chloramphenicol and Ampicillin.

Sala et.al.,(1983) stated that six strains of *Malassezia* (*Pityrosporum*) *pachydermatis* associated with canine otitis were sensitive to Clotrimizole at 0.5% 5mg/ml. 17 strains of Staphylococci were sensitive to Pristinamycin, Cefalotin, Gentamycin and Erythromycin.

Akay et.al., (1984) stated that *Pseudomonas aeruginosa* isolates from otitis externa cases in dogs were resistant to most of the antibiotics tested, although seven isolates were sensitive to Colistin. The other organisms isolated were sensitive to most of the antibiotics.

Knifton (1984) stated that most ear canal infections are mixed. Most commonly Staphylococcus, Streptococci and *Pseudomonas* were identified. Thorough cleaning of auditory canal with cerumenolytics and cetrimide solution should precede antibacterial therapy. In the absence of laboratory diagnosis, topical Neomycin is rational choice in conjunction with topical corticosteroids. Resistant cases are commonly due to *Pseudomonas* infection becoming dominant and treatment might then be selected from topical formulations of Polymixin-B, Silver Sulphadiazine or Gentamycin.

Bogaard et.al., (1986) isolated *Pseudomonas aeruginosa* from auditory canal of 50 out of 62 dogs with chronic purulent otitis externa. All isolates showed multiple drug resistance. After thorough mechanical cleaning of the auditory canal, Silver Sulfadiazine 1% cream (Fammazine) was applied locally every day for ten days. All fifty animals recovered and only one recurrence was observed with in 3 months.

Uchida et.al.,(1990) stated that the 54 isolates from the ear canals with otitis externa were sensitive to Cefazolin, Chloramphenicol and Gentamycin.

Cieslicki (1991) studied the role of glucocorticoids in drug combination against otitis externa in 144 dogs. Miconazole + Polymixin and Miconazole + Polymixin B + Prednisolone were compared in a double blind study. The results showed that the glucocorticoid part of the combination did not affect the bacteriological and mycological cure rate, but caused a quicker clinical healing.

Devaya (1993) in his therapeutic studies on ear infection in dogs used Chloramphenicol and Gentamycin both topically and parenterally and obtained better results with Gentamycin administered topically and parenterally.

Logas (1994) reported that otitis externa could be a complicated and difficult disease to diagnose and treat. Because of the unique physiology of ear canal and common pathophysiology of otitis externa regardless of the underlying cause, the clinician must rely on history, dermatological examination and ancillary tests to determine the cause and appropriate therapy for a particular case.

Uchida et.al.,(1994) conducted a clinical trial to evaluate the efficacy of one percent Piramicin suspension in the treatment of canine otitis externa

associated with *Malassezia pachydermatis* by administering the drug twice daily for a period of two weeks. Satisfactory results were achieved in 33 of 40 dogs without any noticeable side effects of the drug.

2.6 SURGICAL TREATMENT

2.6.1 *Zepp's Aural Resection*

Zepp (1949) devised a procedure of deflecting and grafting a section of the lateral conchal cartilage and tissues of the external ear canal ventral to the meatus. The deflected, grafted section of the cartilage prevents the granulating and contracting tissue from closing the meatus or reestablishing a partial external ear canal and this also serves as a drain board for ear discharges.

Tufvesson (1955) made a comparison and statistical analysis of 353 post-examined dogs subjected to Zepp's operation for otitis externa. Follow up examination were possible in 281 (88.9%) of the animals, with 49.5 percent recovering completely, 15.6 percent showing improvement and 34.9 percent showing little or no improvement. Analysis showed that certain breeds were predisposed to the disease. There was also a marked age disposition. Comparative calculation indicated that the breed disposition was not a mere age effect. There was no definite sex disposition. The results of the surgical treatment proved to be independent of all dogs, breed or age.

Singh and Rao (1959) studied the observations of treatment of 60 cases of otorrhoea in the canine, 42 having been treated medically and 18 surgically. Of the 18 cases that under went surgical interference, 14 were of partial resections and the rest complete. Out of 4 complete resections, 3 have originally been

treated by partial resections. Out of 17 partial resections, 14 made uneventful recovery and 3 cases recurred due to necrotic condition of the vertical canal and hence total resection had to be resorted to. The 18th case, which was operated on both ears simultaneously, one for partial resection and the other for total resection, died of surgical shock as one of the parotid gland was involved and had to be completely extirpated.

Harvey (1980) stated that ear canal surgery takes one of two forms, partial resection or ablation. Partial resection is by far the more commonly used procedure. The classic Procedure (Zepp's procedure) is lateral ear canal resection.

Bojrab and Renegar (1981) recommended surgical intervention for the relief of otitis externa, which might involve either lateral ear resections, or total ablation of the ear canal, when the horizontal part of the auditory canal has undergone irreversible change. It was clearly elucidated that surgery should be considered when 1) persistent or recurrent otitis fails to respond to medical therapy, 2) anatomic deformities such as strictures exist, 3) papilloma are present and, 4) neoplasia occurs. It was further stated that before any surgery is performed, a thorough medical evaluation and treatment should be attempted, since both procedures must be considered salvage procedures, except in case of neoplasia.

Gregory and Vasseur (1983) performed lateral ear canal resection in 26 dogs for the treatment of chronic otitis externa. After a mean follow up period of 4.5 years, 17 of the 26 dogs were available for physical examination. In the examined group, the resolution of clinical signs was good in 41% of dogs,

improved in 12% and poor in 47%. A good result was defined as the elimination of clinical signs, with minimal or no care required from the owner. An improved status was assigned to dogs that experienced occasional reoccurrence of signs requiring professional attention. A poor result was defined as no improvement.

Knifton (1984) stated that aural resection is necessary in chronic cases of otitis externa to provide adequate ventilation and drainage of the canal.

Lane and Little (1986) reported that concurrent otitis media, inadequate drainage from the horizontal ear canal, and irreversible disease of the medial wall of the vertical ear canal were determined to be factors contributing to unsuccessful lateral ear canal resection in 122 dogs.

Bellah (1997) opined that lateral ear canal resection improves drainage from the external ear canal and provides better ventilation, which reduces the ear canal's moisture, humidity and temperature. Lateral ear canal resection improves the ears microclimate by lowering relative humidity by about 10%.

Bellah (1997) reported that in 1995 Johnston studied thirty-three dogs which had no ear discharges or discomfort at examination six months after early lateral drainage (Zepp's) procedure for chronic otitis externa in dogs. Dogs that were determined clinically to be predisposed to otitis externa would likely benefit if the procedure was performed before irreversible changes occurred in the external ear canal, tympanic membrane and tympanic bulla.

Fossum (1997) described the surgical procedure for Zepp's aural resection in dogs. A forceps was positioned into the vertical ear canal to determine its extent. Two parallel incisions were made in the skin lateral to the vertical ear canal upto its entire extent. The incisions were connected ventrally and the skin

flap was dorsally reflected to expose the lateral cartilaginous wall of the vertical ear canal. The vertical ear canal was incised to expose the opening of the horizontal canal. The distal half of the cartilage flap was resected to make a drainboard and the skin flap was cut off. Non-absorbable monofilament nylon sutures were applied to unite the epithelial tissues and skin. Suturing was begun at the opening of the horizontal canal first. Then the drainboard was sutured. The cranial and caudal aspects of the medial wall of the vertical ear canal were sutured to the skin.

Bojrab and Constantinescu (1998) suggested that a lateral ear canal operation is indicated when otitis externa becomes refractory to medical treatment. They stressed that lateral ear canal resection is also indicated for frequent recurrence of otitis externa, for chronic otitis externa resulting from inadequate treatment or lack of treatment and external ear canal thickening does not concurrently obstruct the horizontal portion of the external ear canal. It was further stated that the purpose of lateral ear canal resection is to provide environmental alteration by means of ventilation, so that moisture, humidity and temperature are decreased. Lateral ear canal resection also provides drainage for exudates and moisture in the ear canal.

Sylvestre (1998) analysed the surgical outcome of resection of the lateral wall of the vertical ear canal (Zepp's aural resection) in 60 dogs with otitis externa. The outcome of surgery was considered acceptable in 45% and unacceptable in 55% of cases. The procedure failed in 86.5% of the cocker spaniels, when surgical outcome in breeds other than cocker spaniels were evaluated, 63% were acceptable and 37% were unacceptable.

2.6.2 Vertical Ear Canal Ablation

Singh and Rao (1959) treated chronic otitis externa surgically in 17 dogs. Out of the 17 partial resections, 14 had uneventful recovery and 3 cases recurred. Total resection of vertical ear canal was finally resorted to in these cases with complete recovery.

Siemering (1980) described a surgical technique for ear canal drainage where by the vertical ear canal is removed leaving only the horizontal portion. Of the 75 ears operated on, three were unsuccessful at completely ridding the dog of chronic otitis externa. All the three dogs had severe proliferative changes of the remaining horizontal canal and the inflammation and infection persisted. These three dogs were treated intermittently with topical antibiotics for persistent chronic otitis of the remaining ear canal. The remaining 72 (96%) were asymptomatic with proper antibiotic therapy within 12 weeks postoperatively.

Harvey (1980) described that an alternative to lateral ear canal resection is resection of the entire vertical ear canal and creation of a new ear canal opening at the lateral aspect of the horizontal ear canal. This procedure requires more dissection than a Zepp's procedure and is not recommended for prick-eared dogs because the ears may fail to stand normally post operatively. Vertical ear canal resection is indicated for ears with a severe exudative, hyperplastic otitis externa, particularly where the horizontal canal is not totally obstructed. A small Zepp's flap should be created to prevent the new ear canal opening from retracting medially and becoming obstructed by overlying folds of hairy skin.

Siemering (1980), Turgari and Pinniger (1986), Turgari (1988) and Krahwinkel (1993) reported that the advantages of vertical ear canal ablation over lateral ear canal resection are removal of all infected, inflamed vertical ear canal tissue, less post operative exudation and pain, better healing as a result of less incised cartilage, and a better cosmetic effect.

Turgari and Pinniger (1986) stated that vertical auditory canal was ablated by conventional technique in 7 dogs and by pull through technique in 11 dogs (one bilateral) and one cat. Skin healing by first intention was uneventful in 18 cases. Results were very satisfactory in 15 cases and satisfactory in 2. There was no recurrence of clinical signs or evidence of the new orifice becoming constricted by granulation tissue or scar retraction. In the bilateral case the resected canal remained narrow in one ear. In one dog the new orifice was damaged in a fight after 3 days and disappeared with all clinical signs. No case treated by the pull through technique had more than 8 months follow-up and the short-term nature of the results were satisfactory.

Boothe and Slatter (1992) conducted a retrospective study to determine long-term results of vertical ear canal ablation in 33 dogs. Long-term results were complete resolution (n=6), improvement (n=22), or no improvement (n=5). It was concluded based on results of the study, that vertical canal ablation should result in improvement of clinical signs in 84% of animals with advanced ear disease.

McCarthy and Caywood (1992) treated thirty-six dogs with end stage otitis externa unresponsive to previous medical and surgical therapy by either unilateral or bilateral vertical ear canal resection. Improvement was achieved in 95% of the ears following surgery as indicated by decreased frequency in

medical treatment required to control the disease, increased ease of application of topical medication and reports from owners. There was an absence of clinical signs following vertical ear canal resection in 23% of ears.

Krahwinkel (1993) reported that vertical ear canal resection is usually performed in dogs with tumors or traumatic injuries localized to the vertical ear canal.

Fossum (1997) described vertical ear canal ablation technique for chronic otitis externa in dogs. A T- shaped incision with the horizontal component parallel and just below the upper edge of the tragus was made for vertical ear canal ablation. A vertical incision, which extends to the level of horizontal canal, was made from the mid point of horizontal incision. Vertical canal was exposed after reflecting skin flaps and connective tissue. The horizontal incision was continued through the cartilage around the external auditory meatus. The entire vertical canal was freed from surrounding tissue. The canal was transected 1 to 2 cm dorsal to the horizontal canal. The remnant of vertical canal was incised cranially and caudally to create dorsal and ventral flaps. The ventral flap was sutured to the skin to form a drainboard and the dorsal flap was also fixed to the skin. The skin was closed in T- shaped manner.

Bojrab and Constantinescu (1998) described modified ablation technique, which has been used when entire vertical canal is grossly distorted or filled with hyperplastic tissue. This technique combines the advantages of ablation with those of lateral ear canal resection.

2.7 HISTOPATHOLOGY

Ott (1965) reported that long standing chronic irritation of the ear canal might result in mineralization of the annular and auricular cartilages, which might lead to true ossification.

Fernando (1967) reported that in chronic otitis externa there was hyperplasia of the epidermis with increased activity of the basal stratum cylidricum along with increased thickness of the stratum spinosum and stratum granulosum and dermis was infiltrated with lymphocytes, polymorphonuclear leukocytes, mast cells, and fibroblasts. The dermis was thicker due to the inflammatory reaction. He further noted reduced glandular tissue, thickened and elongated ducts, cord like sebaceous glands, atrophied and degenerated apocrine glands with their ducts shrunken and membranous or absent.

Fraser et.al., (1970) observed hyperemia and frequently numerous extensive areas of ulceration of the lining epithelium in chronic otitis externa. Fibroplasia of the dermis of more chronic cases of otitis externa was noted. The sebaceous glands appeared less active, much smaller and displaced in the superficial dermal layers by the presence of grossly dilated ducts of the ceruminous glands. The ceruminous glands appeared as enormous sac like diverticula distended with an eosinophilic, homogenous colloidal material.

Bojrab and Renegar (1981) reported that microscopically most otitis externa tissues showed hyperplastic changes in the epidermis. In almost all cases numerous aggregates of the inflammatory cells were found in the deeper layers of epithelium and dermis associated with some degree of hyperplasia. Fibroplasia of the dermis and thickening of the subcutaneous tissue resulted in partial to total

occlusion of the external auditory meatus. In chronic otitis externa sebaceous glands were less active and much smaller, and appeared to be displaced in the superficial dermal layers by the presence of grossly dilated ducts of the apocrine glands. In infected ears the apocrine glands appeared as enormous sac like diverticula, distended with an eosinophilic, homogenous colloidal material. The great increase in the size, distribution and state of activity of the apocrine glands accounted, together with the inflammatory reaction and possible presence of pyogenic bacteria, for the changes in the appearance of the ear secretions.

Hobson (1988) noted markedly hyperplastic ceruminous and sebaceous glands with the overlying stratified squamous epithelium thrown up into prominent folds with some areas of superficial ulceration. Within the dermis were found numerous scattered aggregates of inflammatory cells, including mast cells, lymphocytes, plasma cells, eosinophils and neutrophils, often within edematous foci. He also stated that the ossification of the cartilage not only limited the expansibility of the ear canal but also encroached upon the lumen. The ossification, along with the glandular hyperplasia and granulomatous proliferations, often totally occluded the narrow horizontal ear canal.

Menon et.al., (1991) following histopathological examination of ablated ear canal observed hyperkeratosis, acanthosis, focal areas of epidermal necrosis, infiltration of inflammatory cells in the submucosa along with atrophy and proliferative changes involving the sebaceous and ceruminous glands.

Krahwinkel (1993) observed that the inflammatory response with otitis results in damage to the superficial protective stratum corneum of the canal, and also expatiated that hyperplasia and hypertrophy of sebaceous and ceruminous

glands, along with diffuse cellular infiltration of macrophages, mast cells, lymphocytes, plasma cells, neutrophils, and eosinophils.

2.8 COMPLICATIONS OF ZEPP'S AURAL RESECTION AND VERTICAL EAR CANAL ABLATION

Siemering (1980) reported the complication of Zepp's aural resection, which included failure to turn down the cartilage flap far enough ventrally at the junction of the vertical and horizontal ear canal. This resulted in incomplete drainage of exudate and persistence of chronic otitis, persistent infection and inflammation of the cutaneous membrane overlying the remaining medial vertical canal and delayed healing by granulation tissue, if the skin and cartilage are not properly sutured. He also stated that the complication of vertical ear canal ablation include drooping of the pinna in dog with erect ears.

Gregory and Vasseur (1983) reported that healing of open wound by second intention might lead to fibrous contracture and cause stenosis of the horizontal ear canal. Persistent aural inflammation and ulceration cause granulation and formation of scar tissue leading to stenosis of horizontal ear canal.

Tirgari and Pinniger (1986) mentioned that aural ablation of the vertical canal resulted in narrowing, stenosis and skin inversion at the new orifice, or pricked ears tending to lop post-operatively. He stated that aural ablation of vertical canal although associated with complications had many advantages over Zepp's method.

McCarthy and Caywood (1992) reported that an overall complication rate of 19% was attributed to incisional dehiscence (12%), stromal stenosis (7%), surgical infection (1%) and facial nerve palsy (1%).

Krahwinkel (1993) reported that complications associated with Zepp's aural resection were irreversible changes in the ear canal, failure to drain the horizontal canal properly, strictures of the horizontal canal, presence of concurrent otitis media, and partial dehiscence of the suture line. He also stated that vertical ear canal ablation has fewer complications than lateral wall resection. Post-operative stenosis of the horizontal canal may occur but is less likely if the baffle plate is used.

McCarthy (1996) reported that complications associated with Zepp's aural resection and vertical ear canal ablation included incisional dehiscence, stenosis of the remaining horizontal ear canal, infection and failure to alleviate aural inflammation. He further reported that additional potential complications of vertical ear canal ablation included facial nerve palsy and failure of erect ears to stand.

Fossum (1997) reported that complications other than inadequate drainage and continued otitis externa are uncommon after lateral ear resection or vertical ear canal ablation.

Bellah (1997) reported that the complications of vertical ear canal resection and Zepp's aural resection were found to be similar. They included dehiscence of the skin-horizontal canal closure, recurrence of tumor growth because of an inadequate tissue margin, and progression of otitis externa.

Salisbury (1999) reported that postoperative complications of lateral ear canal resection included dehiscence, wound infection, self-mutilation, facial nerve palsy, injury to the parotid gland and inadequate drainage. He suggested that most of the complications could be prevented by careful attention to pre-operative patient management, surgical technique and post-operative management.

CHAPTER III

MATERIALS AND METHODS

3.1 MATERIALS

The present clinical study was carried out on 88 dogs presented for treatment of chronic otitis externa to the Teaching Veterinary Clinical Complex at Teaching Veterinary Hospital, College of Veterinary Science, Rajendranagar, Hyderabad and Bhoiguda, Secunderabad. Routine drugs, diagnostic aids, instruments and treatment regimens were used for carrying out the present study. The dogs presented for treatment of chronic otitis externa were in the age group of 1-14 years. Among these dogs 59 were males and 29 were females.

3.2 DESIGN OF STUDY

A total number of eighty-eight clinical cases of dogs with otitis externa formed part of the present study.

Based on the clinical examination and clinical assessment, in 74 dogs (84.09%) where medical management was considered sufficient, they were treated by topical and parenteral administration of antibiotics as described later.

Of the remaining 14 dogs, which had signs indicating the necessity of surgical treatment, 7 dogs were treated by performing Zepp's aural resection and the remaining 7 dogs were treated by performing vertical ear canal ablation.

3.3 METHODS

3.3.1 *Incidence*

The data regarding the details of incidence of chronic otitis externa were recorded. Data like age, sex, breed, whether the condition was unilateral or bilateral, time since clinical signs were present was recorded.

3.3.2 *Clinical Examination*

3.3.2.1 Clinical Signs. A thorough physical examination of ear was carried out. The various clinical signs exhibited by the animal as well as those reported by the owners were recorded. Both the ear canals were inspected in all the cases even through unilateral disease existed. Ear canals were observed for ulceration, discharge, tumors, and proliferation of cartilage or bone around the horizontal ear canal. Facial nerve function was examined before surgery. Facial nerve deficits such a poor palpebral reflex, lip droop and facial spasms were evaluated.

3.3.2.2 Collection of ear swabs and cultural examination. Sterile swabs* were used to collect discharges from the ear by taking all possible aseptic measures. With in 3-4 hours, the swabs were transferred to the laboratory. Bacterial culture and antibiotic sensitivity tests were performed as per the procedure described by Cruickshank et.al., (1975).

* Himedia Laboratories Ltd. Mumbai, India.

3.4 MEDICAL EXAMINATION

The dogs suffering from otitis externa were examined properly, under anaesthesia or deep sedation so to avoid shaking its head. Specimens were collected from the ear canal by swabbing before any irrigation solutions were used. After irrigating the ear canal with sterile normal saline, medication was done according to the results of antibiotic sensitivity test for a particular animal both parenterally and as eardrops.

The different parenteral and topical preparations used for the medical treatment of otitis externa in the present study are presented in table 1.

The clinical outcome in all the dogs following the medical treatment was recorded.

3.5 SURGICAL TREATMENT

Fourteen out of the 88 cases were selected for surgical correction.

Out of these 14 dogs, 7 were subjected to Zepp's aural resection and remaining 7 were subjected to vertical ear canal ablation.

3.5.1 *Zepp's Aural Resection*

3.5.1.1 Preparation of Patients. Owners were advised to withhold food for about 12 hours and water for about 6 hours prior to operation. The earflap and side of the face was prepared by clipping of hair, shaving and scrubbing with

Chlorhexidine gluconate – Cetrimide* solution and rinsing with water. The ear was gently flushed with sterile normal saline and as much debris as possible was removed.

Table 1. Medical Treatment Regimen followed.

S.No	Name of the drug	Injection/Drops	Dosage	Name of the Manufacturer	Route	No.of Days
1	Ciprofloxacin	Injection	10 mg/kg.body wt (BID).	Cadila Health Care Mainagar, Ahmedabad-300009	I/V	5
2	Ciplox	Ear drops	8-10 drops of 0.3% solution instilled thrice a day	Cipla Bombay Central, Mumbai-400008, India.	Ear drops	5
3	Gentamycin	Injection	4 mg/kg.body wt. (BID)	Alembic chemical Works, Alembic road, Baroda-390003 India.	I/M	5
4	Genticyn	Ear drops	8-10 drops of 0.3% solution Instilled Thrice a day	Allergan India Ltd. Banglore-560042, India	Ear drops	5
5	Chlorophen	Injection	25 mg/kg.body wt. (BID)	Vet India Pharmaceutical, Kamala Nagar, Hyderabad-62	I/V	5
6	Chlormycetin	Ear drops	8-10 drops of 5% w/v solution instilled thrice daily	Parke Davis India Ltd. Nirlon House, Mumbai-400025	Ear drops	7
7	Intamox	Injection	15 mg/kg.body wt.	Intas Pharma, Chinubhai Centre, Ahmadabad-9	I/M	5
8	Mammitel	Topical	0.5 g applied	Intas Pharma, Chinubhai centre, Ashram road, Ahmedabad-9.	Topical	5
9	Alcyclin-O	Injection	10 mg/kg.body wt.	Alembic chemical Works, Alembic road, Baroda-390003 India.	I/M	5
10	Terramycin	Topical	8-10 drops of 0.5% solution instilled thrice a day	Pfizer. Animal Health Division, P.B.No.11602, Mumbai-21, India	Topical	5

* Savlon- Johnson & Johnson Ltd., 30, Forjett street, Mumbai-36

3.5.1.2 Anaesthetic Procedure. Triflupromazine hydrochloride** at the rate of 1 mg/kg body weight was administered as preanaesthetic medication prior to induction of anesthesia. General anesthesia was induced by using 2.5 percent thiopentone sodium*** at the rate of 20 mg/kg body weight intravenously and when found necessary; anesthesia was maintained by additional doses of thiopentone sodium. The dogs were intubated with endotracheal tubes of suitable size.

3.5.1.3 Surgical Procedure for Zepp's Aural Resection. A forceps was positioned into the vertical ear canal (fig.1) to determine its ventral extent that was marked off. Two parallel incisions were made in the skin lateral to the vertical ear canal that extended from tragus ventrally to the marked site (fig.2). These incisions were one and half times the length of the vertical ear canal. The skin incisions were connected ventrally and using a combination of sharp and blunt dissection, the skin flap was reflected dorsally to expose the lateral cartilaginous wall of the vertical ear canal (fig.3). The parotid gland at the ventral extent of the incision was noticed and care was taken to avoid damaging it. Mayo scissors were used to cut the vertical canal (fig.4). Care was taken not to allow the incision to converge. The incision was extended as far distally as the beginning of the horizontal ear canal. The cartilage flap was reflected distally and the opening of the horizontal canal was inspected (fig.5). The distal half of the flap was resected to make a drain board, and the skin flap was removed (fig.6&7). The ligament between the horizontal and vertical flaps acted as a hinge to allow proper drainage. Non-absorbable monofilament nylon sutures were

** Siquil- Sarabhai Chemicals Ltd. Vadadora, India.

*** Pentothal Sodium- Abbott Laboratories Ltd., Mumbai, India.

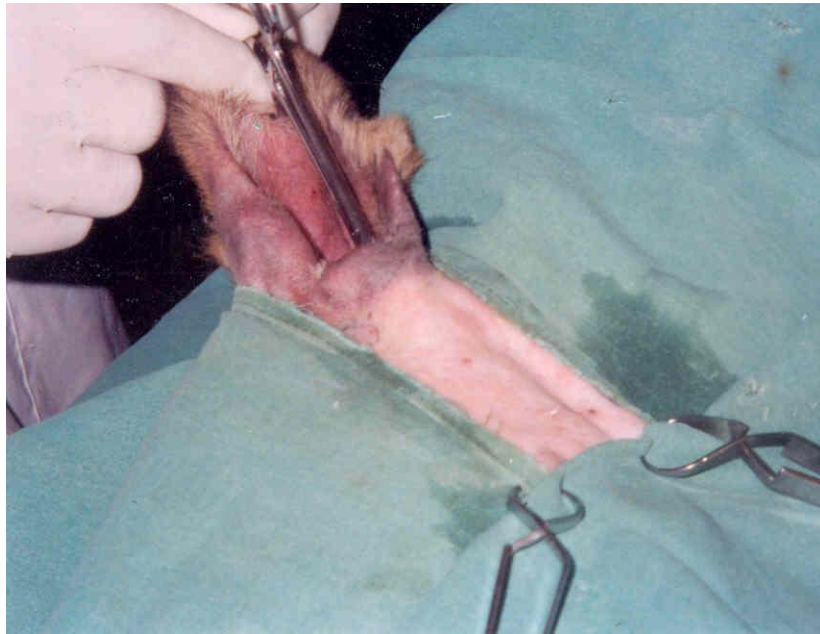


Fig.1 : Zepp's aural resection- Forceps positioned into the vertical ear canal.

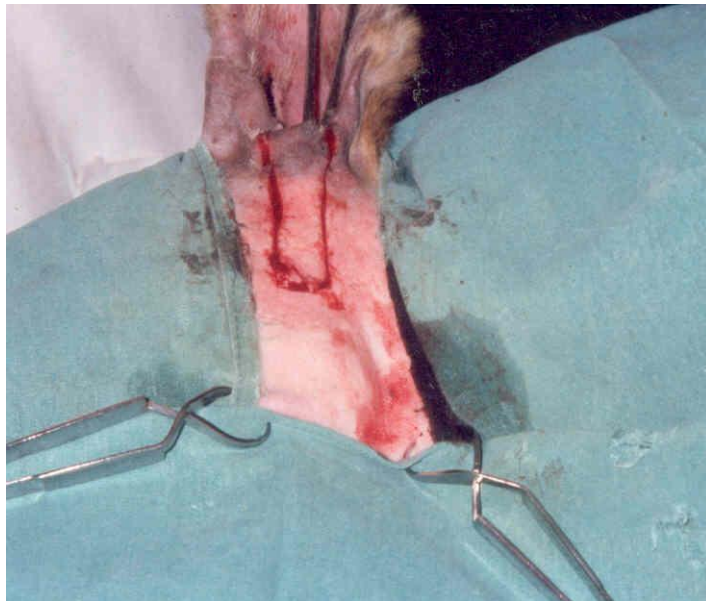


Fig.2 : Zepp's aural resection- Two parallel skin incisions were made and connected ventrally.

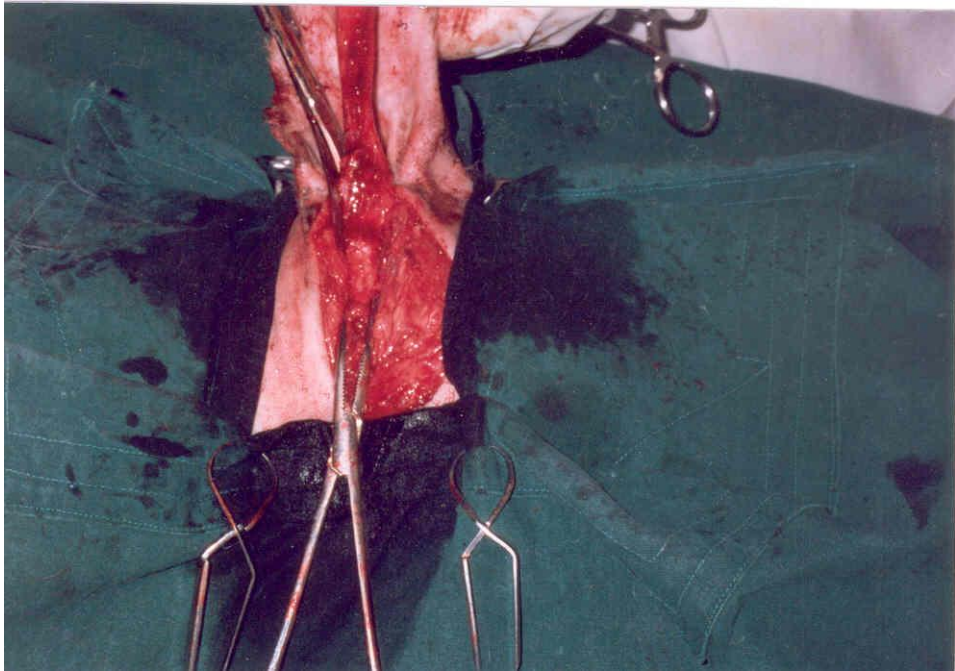


Fig.3 : Zepp's aural resection- The lateral cartilaginous wall of the vertical ear canal was exposed.

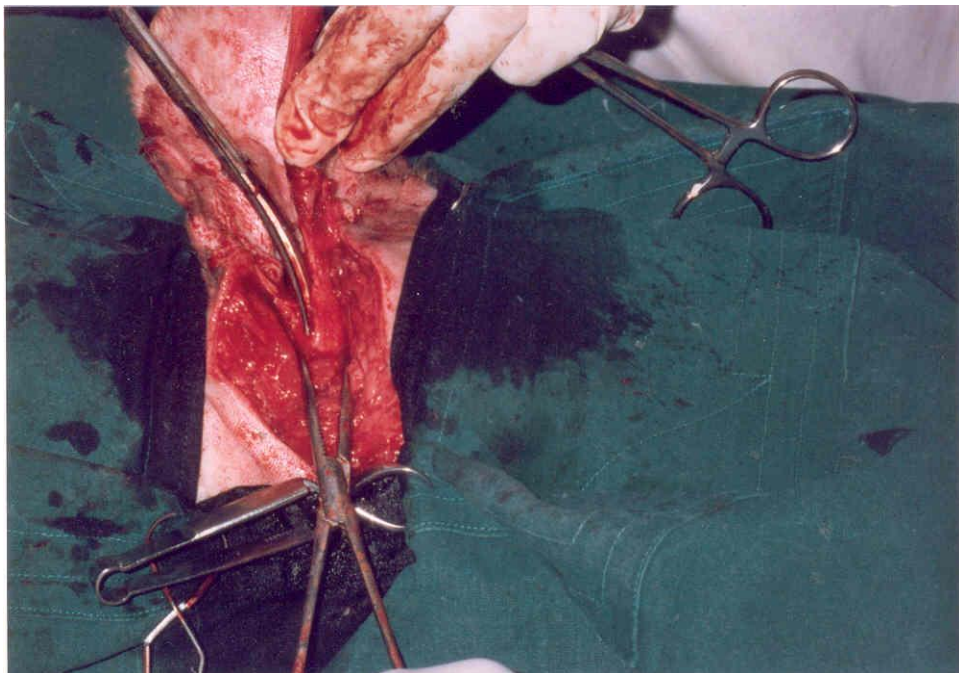


Fig.4 : Zepp's aural resection- Cutting the vertical ear canal.



Fig.5 : Zepp's aural resection- Reflecting the cartilaginous flap distally exposed the horizontal canal.

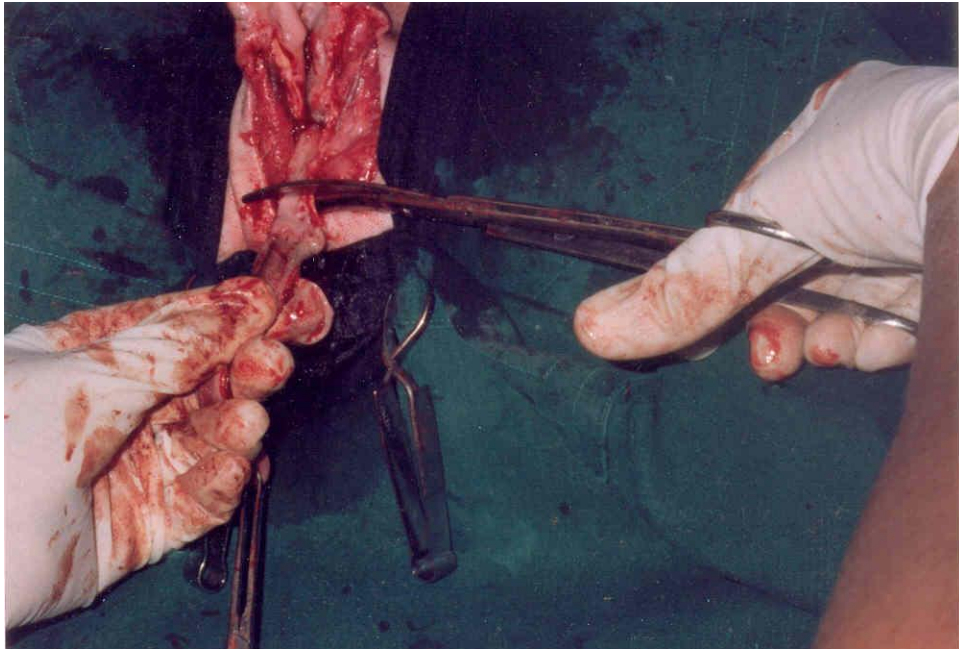


Fig.6 : Zepp's aural resection- Cartilage flap was resected for making the drainboard.

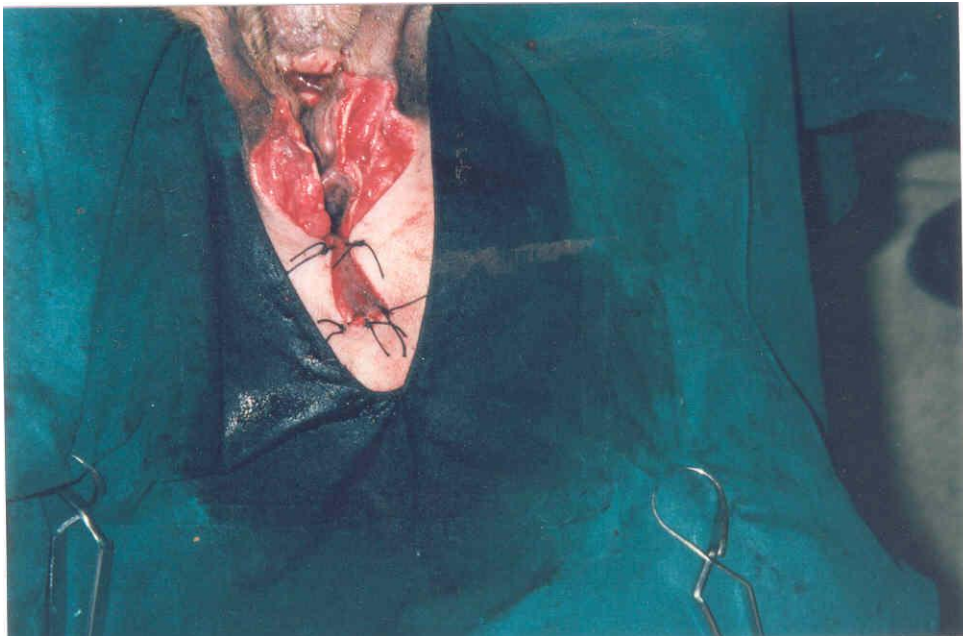


Fig.7 : Zepp's aural resection- Suturing the drainboard.

applied to unite the epithelial tissues and skin. Suturing was begun at the opening of the canal first. Then cranial and caudal aspects of the medial wall of the vertical ear canal were sutured to the skin (fig.8).

3.5.1.4 Post-operative Care. Routine post-operative care was taken. The post-operative care comprised of examination of operative site for discharges from the ears and administration of antibiotic found sensitive for particular animal either parenterally or orally twice daily for seven days. Diclofenac sodium at the rate of 1mg/kg body weight was administered intramuscularly for 3days post-operatively. The protective bandage was applied up to the second or the third post-operative day and there after the wound was left unbandaged. Sutures were removed 10 to 14 days post-operatively.

3.5.2 Vertical Ear Canal Ablation

3.5.2.1 Preparation of patient and anesthesia. The dogs were prepared for surgery and anesthesia as described earlier.

3.5.2.2 Surgical Procedure for Vertical Ear Canal Ablation. A 'T' shaped incision was made with horizontal component parallel and just below the upper edge of the tragus. From the mid point of the horizontal incision, a vertical incision was made, that extended to the level of horizontal canal (fig.9). The skin flaps were retracted and the loose connective tissue was reflected to expose the lateral aspect of the vertical canal (fig.10). The horizontal incision was continued through the cartilage around the external auditory meatus with a scalpel blade (fig.11). As much of the diseased tissue on the medial surface of the pinna as



Fig.8 : Zepp's aural resection- Medial wall of the vertical ear canal was sutured to the skin.

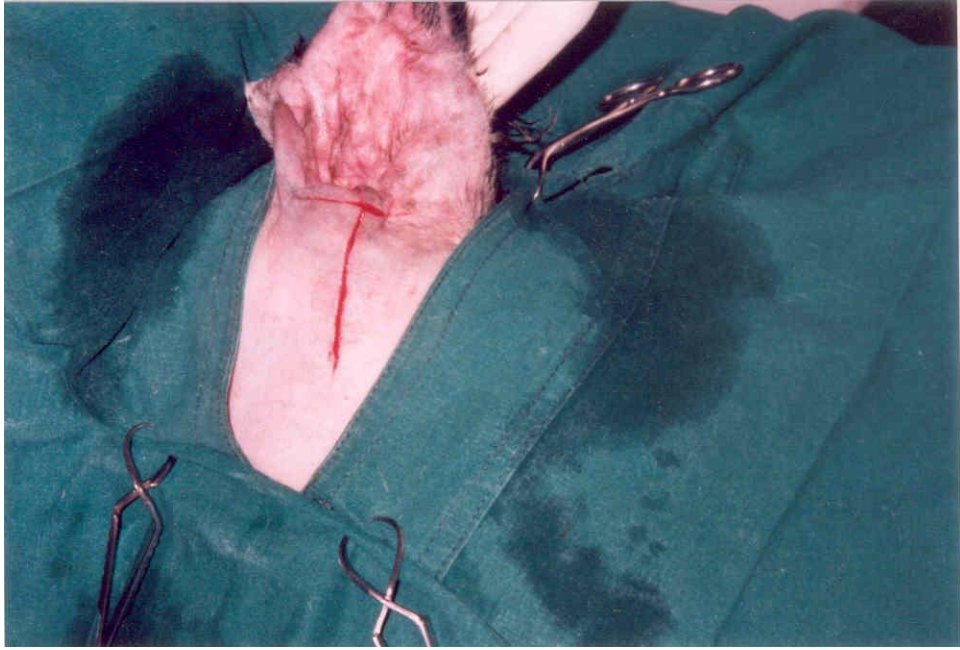


Fig.9 : Vertical ear canal ablation- 'T' - shaped skin incision was made.

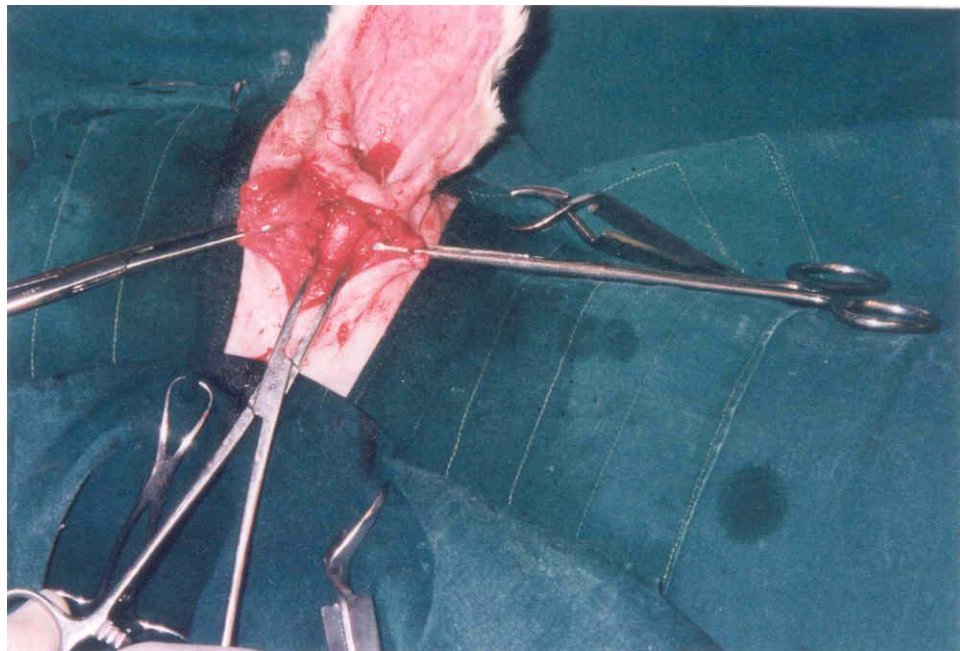


Fig.10 : Vertical ear canal ablation- Exposing the vertical canal after retracting the skin flaps.

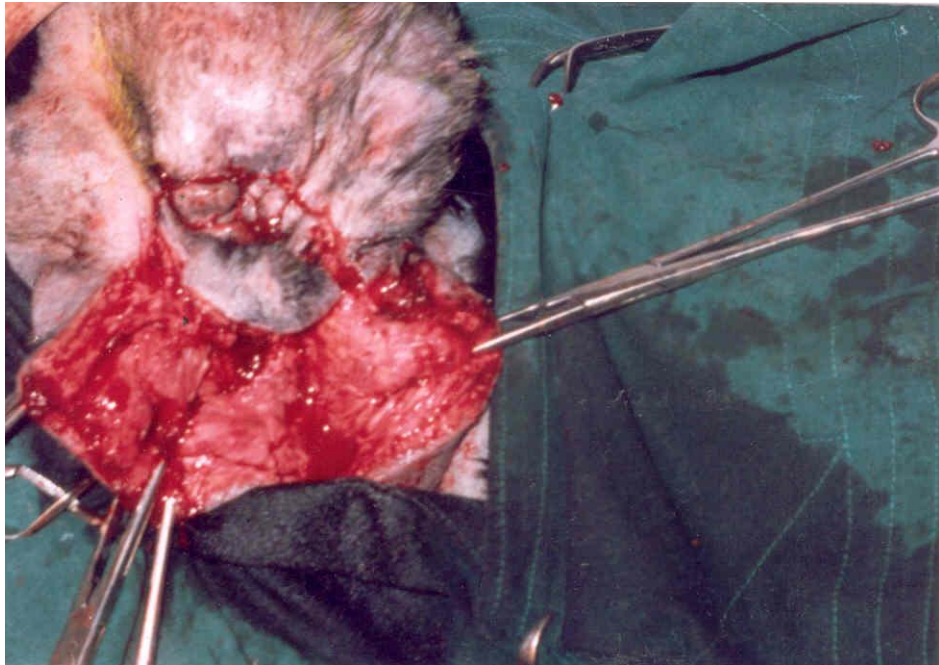


Fig.11 : Vertical ear canal ablation- The horizontal incision continuing through the cartilage around the external auditory meatus.

possible was removed. Care was taken to avoid damage of the major branches of the great auricular artery. By using curved mayo scissors dissection was continued around the proximal and medial aspect of the vertical canal. Dissection was performed as close as possible to the cartilage of the ear canal for avoiding inadvertent damage to the facial nerve. The entire vertical canal was made free from muscular and fascial attachments (fig.12). The vertical ear canal was transected 1 to 2 cm dorsal to the horizontal canal (fig.13). The remnant of the vertical canal was incised and reflected to create dorsal and ventral flaps (fig.14&15). The ventral flap was reflected downwards and sutured to the skin to form a baffle plate using monofilament polyamide* suture (2 –0)(fig.16). The dorsal flap was sutured to the skin. The skin incision was closed in a T – shaped manner (fig.17). In two dogs, it was not possible to create a baffle plate. Hence, the surgical procedure was completed without creating one (fig.18&19).

3.5.2.3 Post-operative Care. Routine postoperative care was taken as described earlier

3.6 HISTOPATHOLOGICAL EXAMINATION

The transected portions of the vertical ear canal obtained following the two surgical procedures were cut into small pieces of suitable size. The tissue specimens were fixed in 10% formalin. The preserved tissues were then washed in running water and processed and embedded in paraffin wax to prepare blocks. Sections of 3 to 5 microns were cut and mounted on slides and stained with standard Haematoxylin – Eosin stain (H & E) (Luna, 1968). The slides were then examined to study the histopathological changes in the tissue specimens.

* Sutupak-Ethicon A division of Johnson & Johnson Limited, Mumbai.

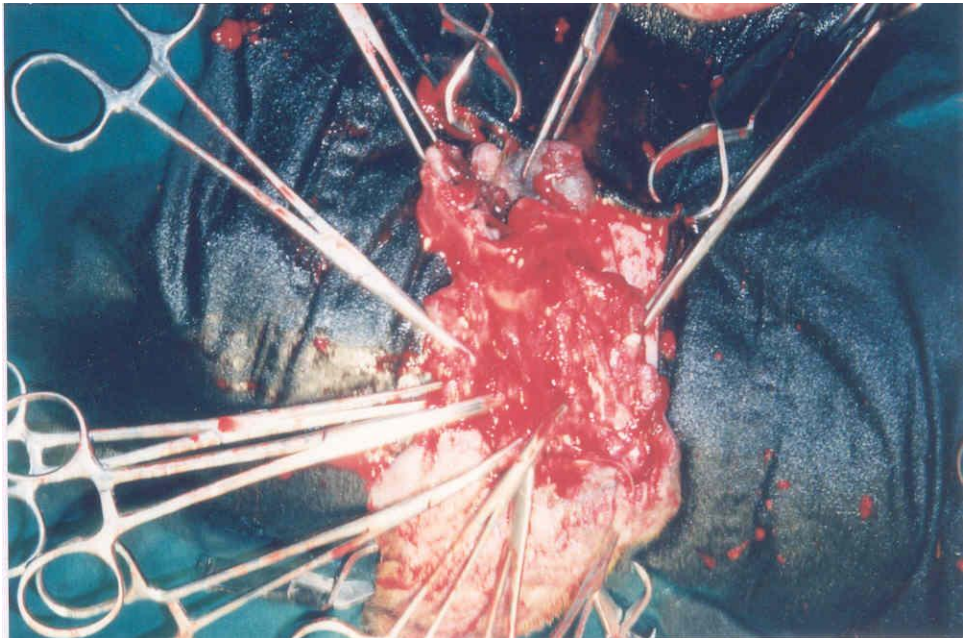


Fig.12 : Vertical ear canal ablation- The entire vertical canal freed from the surrounding tissue.

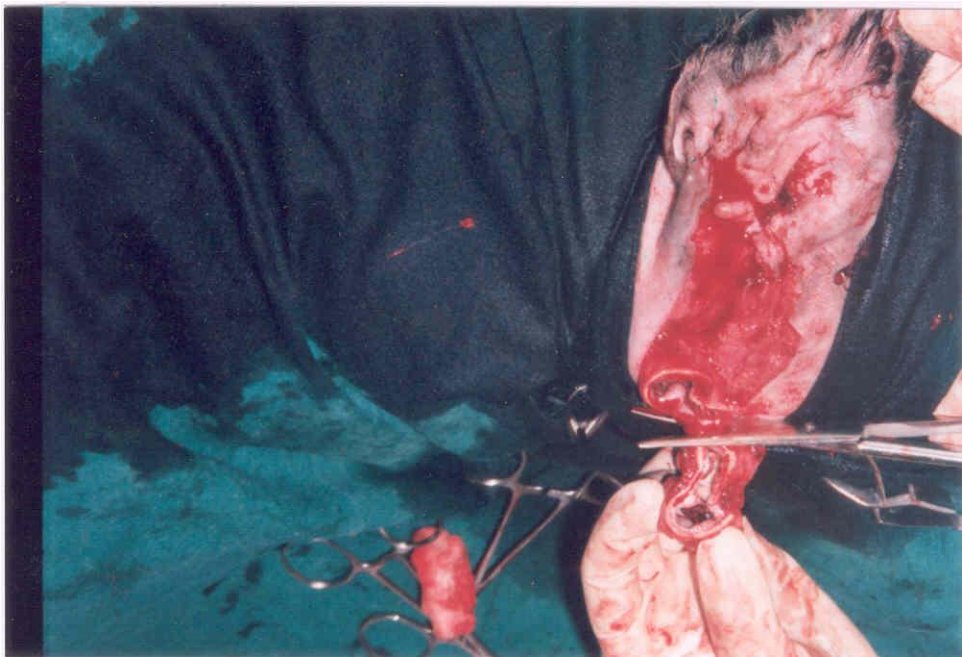


Fig.13 : Vertical ear canal ablation- Transecting the vertical canal close to the horizontal canal.

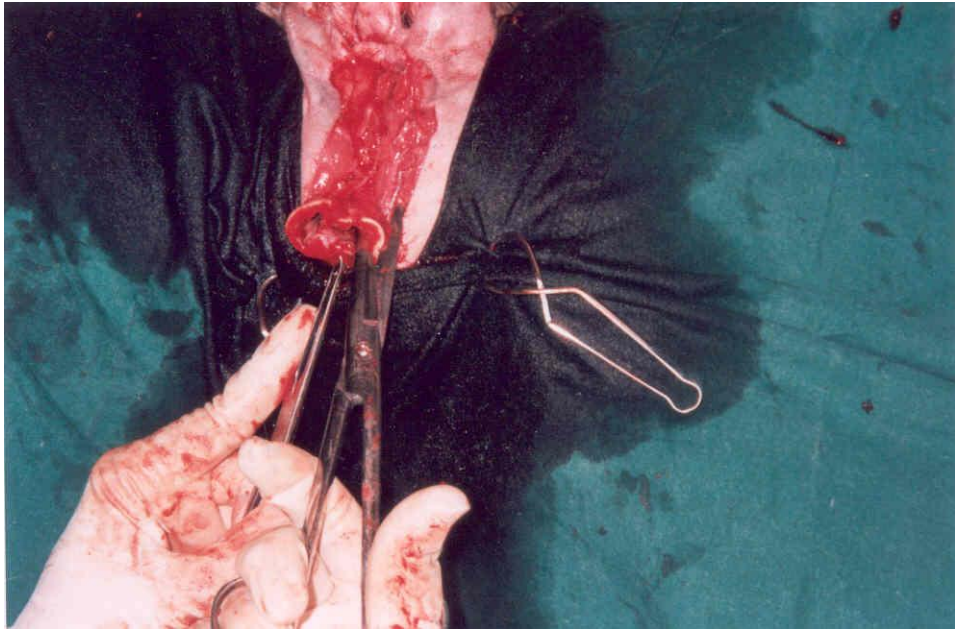


Fig.14 : Vertical ear canal ablation- Incising the vertical canal for making flaps

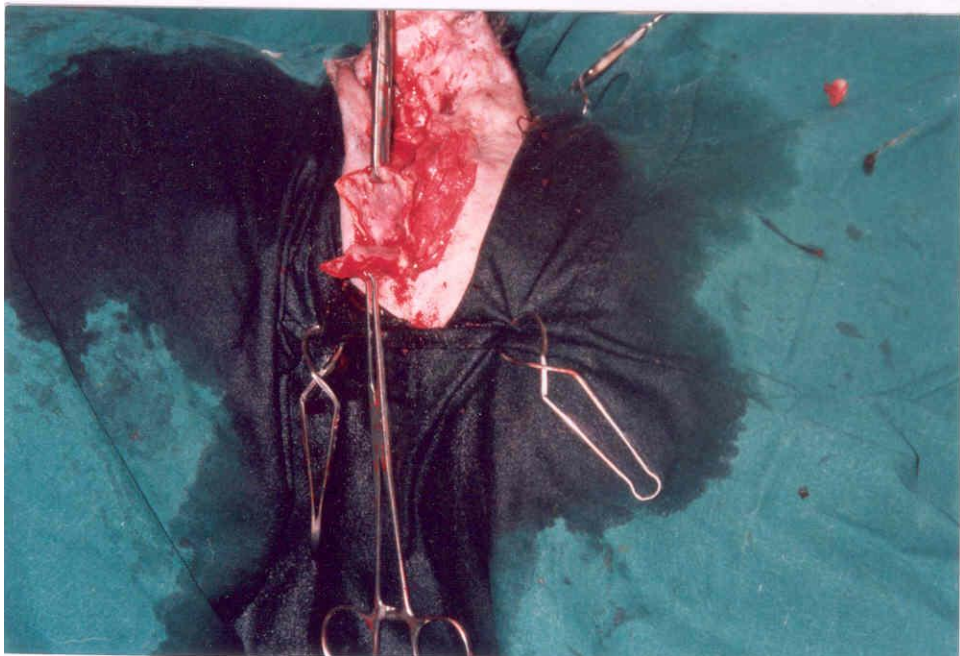


Fig.15 : Vertical ear canal ablation- Showing the dorsal and ventral flaps of the vertical canal.

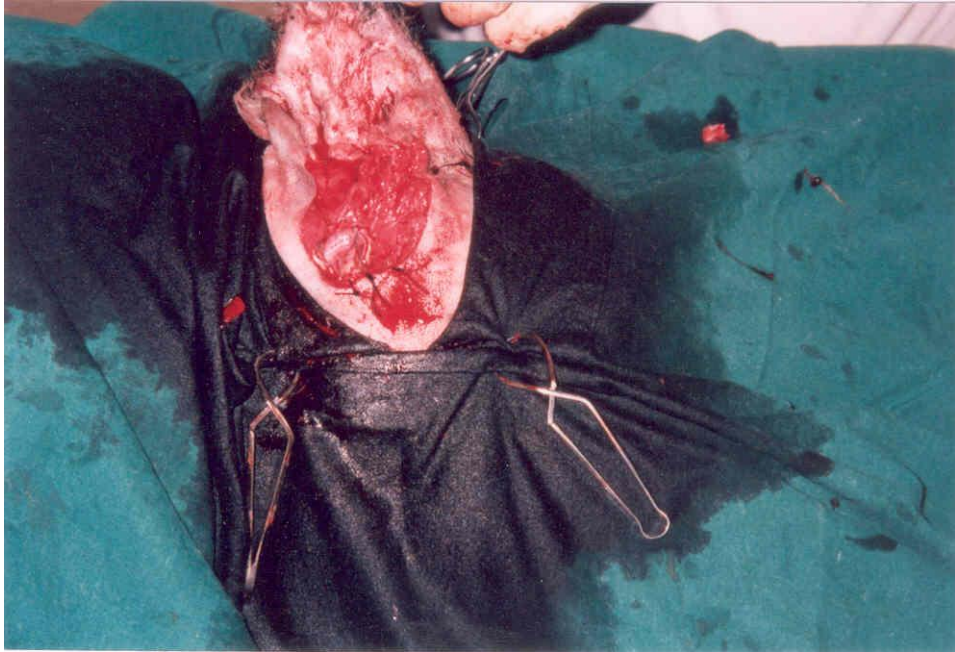


Fig.16 : Vertical ear canal ablation- Ventral flap sutured to the skin for making drainboard.

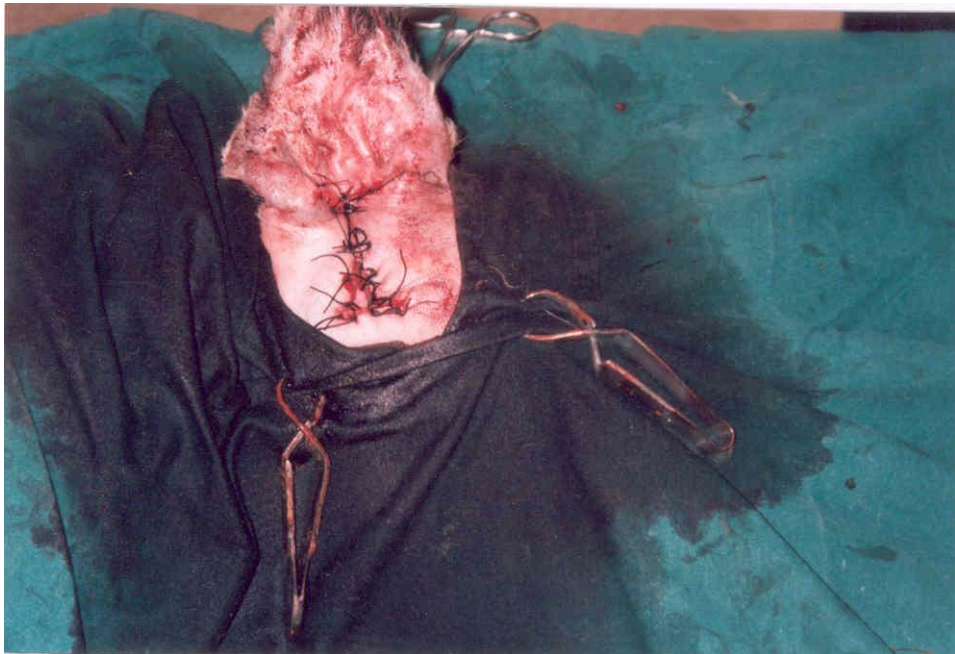


Fig.17 : Vertical ear canal ablation- The skin incision closed.

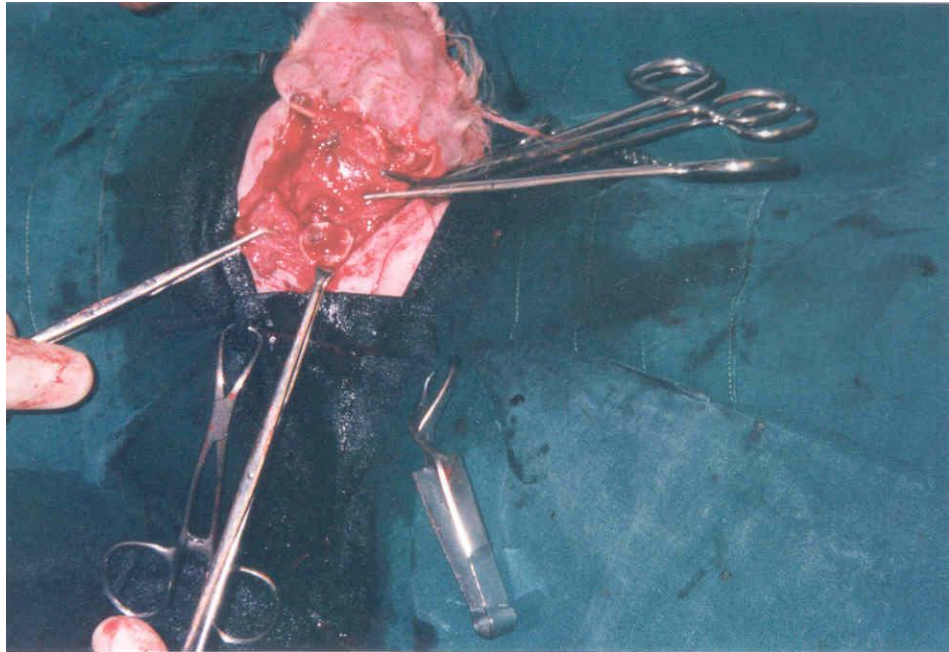


Fig.18 : Vertical ear canal ablation with out baffle plate- Exposing the horizontal canal by transecting the ear canal at the junction of vertical canal with annular cartilage.

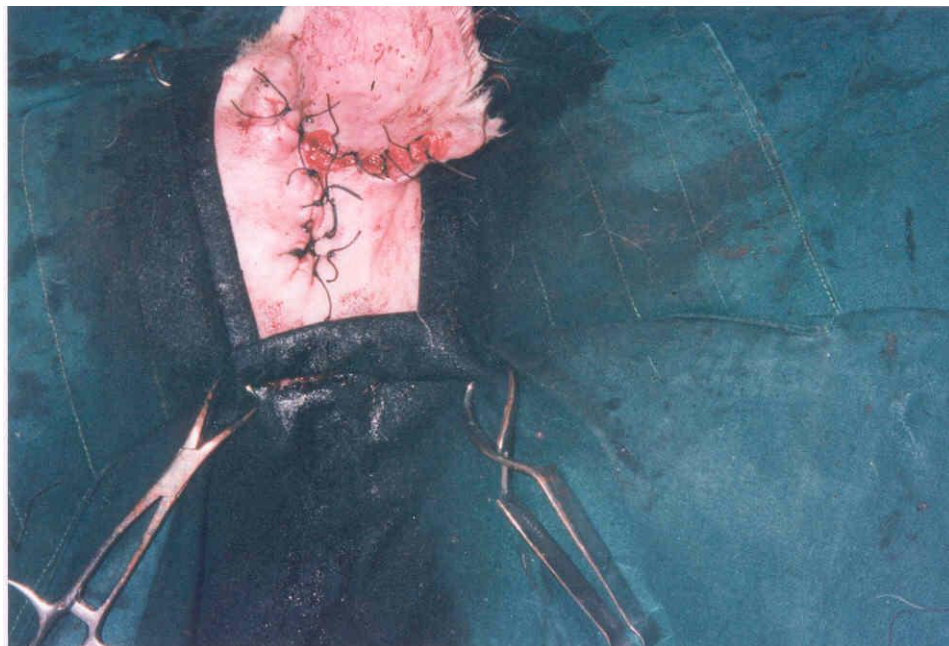


Fig.19 : Vertical ear canal ablation with out baffle plate- Closed the skin incision in a T - shaped manner.

3.7 STATISTICAL ANALYSIS

The breed wise incidence of chronic otitis externa in dogs was treated by Chi-square test (Snedecor and Cochran, 1994) with an assumption that all the breeds studied were equally susceptible to chronic otitis externa.

CHAPTER IV

RESULTS

4.1 INCIDENCE

4.1.1 *Age distribution*

All the dogs, which were evaluated for the treatment of chronic otitis externa, were categorized into different age groups. The incidence of age distribution of chronic otitis externa was analyzed. Of the total 88 dogs with chronic otitis externa, 17 (19.31%) were in the age group of 0-3 years, 39 (44.32%) were in the age group of 3-6 years, 21 (23.86%) were in the age group of 6-9 years and 11 (12.5%) were above 9 years of age.

The mean age of presentation of dogs with otitis externa was found to be 5.21 ± 0.27 years.

As far as the 14 cases that necessitated surgical correction, the mean age were found to be 7.07 ± 0.23 years.

4.1.2 *Breed distribution*

The study of the breed distribution of chronic otitis externa revealed that a majority of cases of chronic otitis externa were noticed in the German Shepherd accounting for 42 cases (47.72%). 14 cases (15.90%) of otitis externa were seen in Spitz, 14 (15.90%) in the mongrels, 10 (11.36%) in the Labrador's, 6 (6.81%) in the Doberman and 2 (2.27%) in the Dachshund. The details regarding the breed distribution of chronic otitis externa are tabulated in table 2

Table 2.The Breed distribution of the chronic otitis externa

S.No	Breed	No.of Cases	Percentage
1	German Shepherd	42	47.72%
2	Spitz	14	15.90%
3	Mongrels	14	15.90%
4	Labrador	10	11.36%
5	Doberman	6	6.81%
6	Dachshund	2	2.27%
Total		88	100.00%

Results of the chi-square test revealed that the incidence of chronic otitis externa among the 6 breeds was significantly different. The incidence was highest in German shepherd, while the lowest incidence was observed in Dachshunds.

4.1.3 Sex distribution

Among all the 88 dogs studied for chronic otitis externa 59 (67%) were males and remaining 29 (33%) were females (table 3).

Table 3. Details showing sex wise incidence

S.No	Sex	No.of cases	Percentage
1	Male	59	67%
2	Female	29	33%
Total		88	100%

4.2 CLINICAL SIGNS

The various clinical signs observed in dogs with otitis externa included variable degrees of head shaking, scratching, pain, odour, ear discharges (fig.20& 21) and head tilt. Visual examination of ear canal revealed hyperplasia, thickening, ulceration, stenosis (fig.22 & 23) and calcification of ear canals in 14 cases. Some dogs were infested with maggots followed by chronic otitis externa (fig.24). All these 88 (100%) dogs suffering from otitis externa had ear scratching, while 74 (84.09%) dogs had ear pain, 72 (81.81%) had head shaking, 70 (79.54%) had ear discharge and 30 (34.09%) had head tilt. The clinical signs are presented in table 4.

Table 4. Clinical signs of chronic otitis externa

S.No	Clinical Signs	No.of dogs	Percentage
1	Ear Scratching	88	100.00%
2	Ear Pain	74	84.09%
3	Head Shaking	72	81.81%
4	Ear Discharge	70	79.54%
5	Head Tilt	30	34.09%

Out of 88 dogs examined, 27 dogs had unilateral ear disease and 61 dogs had bilateral ear disease. The details of dogs with unilateral or bilateral ear disease are presented in table 5.

Table 5. Showing dogs with unilateral /bilateral ear disease.

S.No	Unilateral/ Bilateral	No.of cases	Percentage
1	Unilateral	27	30%
2	Bilateral	61	70%
Total		88	100%



Fig.20 : Purulent discharge in a dog with chronic otitis externa.



Fig.21 : Brown colour discharge in chronic otitis externa.



Fig.22 : A case of chronic otitis externa showing blood discharges, hyperplasia, ulceration, and complete stenosis of ear canal.



Fig.23 : Stenotic ear canal in a dog with chronic otitis externa.



Fig.24 : Maggot wound of external ear canal associated with chronic otitis externa.

The 14 dogs that were considered unsuitable for medical treatment exhibited symptoms like hyperplasia of ear canal, narrowing of the vertical ear canal and severe ulceration. All these dogs had history of being repeatedly treated elsewhere for otitis externa unsuccessfully.

4.3 CULTURAL EXAMINATION OF EAR DISCHARGES

The results of cultural examination of the ear discharges are projected in table 6. Among the various bacteria isolated, 51 (58.00%) of the isolates belonged to Staphylococcus sp., 24 (27.27%) were Pseudomonas and 13 (14.77%) were E.coli.

Table 6.Type of bacteria isolated from ear discharge

S.No	Name of Organism	No.of isolates	Percentage
1	Staphylococcus sp.,	51	58.00%
2	Pseudomonas	24	27.27%
3	E.coli	13	14.77%
	Total	88	100.00%

4.4 ANTIBIOTIC SENSITIVITY TEST

Ciprofloxacin was found to be the most effective drug with 31(35.22%) cases responding to the drug, while Gentamycin was found to be drug of choice in 25(28.40%) cases, Chloramphenicol in 22 (25.00%) cases, Amoxycillin in 6 (6.81%) cases and Oxytetracycline in 4 (4.54%) cases. The results of antibiotic sensitivity test are documented in table 7.

Table 7. Results of the antibiotic sensitivity test of the isolates from otitis externa cases.

S.No	Antibiotic	No.of cases Showing Sensitivity	Percentage
1	Ciprofloxacin	31	35.22%
2	Gentamycin	25	28.40%
3	Chloramphenicol	22	25.00%
4	Amoxycillin	6	6.81%
5	Oxytetracycline	4	4.54%

4.5 MEDICAL TREATMENT

During this study 88 cases were clinically evaluated for chronic otitis externa. Out of these, 74 dogs were treated by thoroughly irrigating the ear canal with sterile normal saline and topical and parenteral administration of appropriate antibiotics as determined by antibiotic sensitivity test. The results showed that 62 (83.78%) dogs responded well to the treatment and all the symptoms of otitis externa were alleviated. Six dogs were presented again with recurrence approximated 4-6 weeks following primary treatment. These responded to treatment when the medical treatment regimen was repeated. The remaining six dogs were not available for follow-up.

4.6 SURGICAL TREATMENT

Surgical therapy of chronic otitis externa was performed when earlier repeated medical management failed elsewhere and stenotic canals and proliferative growth were present. The surgical alternatives in animals with

chronic otitis externa included Zepp's aural resection and vertical ear canal ablation.

4.6.1 *Zepp's Aural Resection*

Based on the chronicity and extent of inflammatory changes of the ear canal, Zepp's aural resection was performed in 7 dogs. All the 7 dogs where Zepp's aural resection was performed recovered uneventfully. All the dogs after surgery had been administered appropriate antibiotics based on antibiotic sensitivity test. Post-operative administration of Diclofenac sodium proved effective in control of pain. No swelling or discharge from the operative site was observed during the post-operative period. Incisional dehiscence (fig.25) was observed in one case. The wound was left open and the healing was considered satisfactory. No collection of exudate was noticed in any of the dogs. Sutures were removed on the tenth post-operative day (fig.26 & 27). The clinical results of Zepp's aural resection were summarized in the table 8.

4.6.2 *Vertical Ear Canal Ablation*

Preoperative evaluation of the dogs revealed that neurological abnormalities referable to the inner ear or facial nerve paralysis were not observed in any of the dogs. Based on the chronicity and condition of vertical ear canal, either partial stenosis or complete stenosis, vertical ear canal ablation was performed in 7 dogs. Out of the 7 dogs, 5 dogs were subjected for vertical ear canal ablation by creating a baffle plate and 2 dogs were subjected for vertical ear canal ablation without baffle plate (fig.28) owing to the ossification of ear canals. All the 7 dogs, which underwent vertical ear canal ablation, were relieved from



Fig.25 : Zepp's aural resection- Incisional dehiscence at ventral aspect of drainboard after removal of sutures - 10th Post-operative day.



Fig.26 : Zepp's aural resection- Normal healing of ear after suture removal - 10th Post-operative day.



Fig.27 : Zepp's aural resection- Appearance of opening of horizontal canal - 15th Post-operative day.



Fig.28 : Vertical ear canal ablation without baffle plate - Normal healing of ear after removal of sutures - 10th Post-operative day.

TABLE 8. CLINICAL RESULTS OF ZEPP'S AURAL RESECTION IN CHRONIC OTITIS EXTERNA OF DOGS

Sl. No.	Breed	Sex	Age	Duration Of Clinical signs	Unilateral/ Bilateral	Pre-operative ABST & Culture	Post-operative Medication	Complications; If any	Results
1	German Shepherd	Female	3 years	Since one year	Bilateral	Ciprofloxacin Pseudomonas sp., Staphylococcus sp.	Antibiotics for 7 days	Incisional dehiscence	Good
2	German Shepherd	Male	8 years	Since two years	Unilateral (Left ear)	Chloramphenicol E.coli	Antibiotics for 7 days	Nil	Good
3	German Shepherd	Male	8 years	Since two years	Bilateral (Right is more chronic than left ear)	Ciprofloxacin Staphylococcus sp., E.coli.	Antibiotics for 7 Days	Nil	Good
4	Cross Breed	Female	7 years	Since two years	Unilateral (Right ear)	Amoxycillin Staphylococcus sp.,	Antibiotics for 7 days	Nil	Good
5	Cross Breed	Male	6 years	Since 6 months	Bilateral (Left ear is more chronic than right ear)	Ciprofloxacin Staphylococcus sp., Pseudomonas sp.,	Antibiotics for 7 days	Nil	Good
6	Cross Breed	Male	6 years	Since 6 months	Bilateral (Right ear is more chronic than left ear)	Ciprofloxacin Staphylococcus sp., Pseudomonas sp.,	Antibiotics for 7 days	Nil	Good
7	Cross Breed	Female	3 years	Since 8 months	Bilateral	Ciprofloxacin Staphylococcus sp., E.coli.	Antibiotics for 7 days	Nil	Good

the clinical symptoms of otitis externa. All the dogs after surgery were administered appropriate antibiotics based on antibiotic sensitivity test. Post-operative administration of Diclofenac sodium proved effective in control of pain. Delayed healing was observed in one case due to dehiscence of wound (fig.29). No swelling or exudate was observed in any of the dogs. The sutures were removed on the tenth post-operative day (fig.30). Clinical results of vertical ear canal ablation were summarized in table 9.

4.7 HISTOPATHOLOGICAL EXAMINATION

Histopathological examination of sections of ear canal with chronic otitis externa in dogs showed mild congestion with round cell infiltration (fig.31). Some sections showed moderate to severe infiltration by inflammatory cells, which included plasma cells and macrophages (fig.32). In some cases focal areas of round cell infiltration with mild congestion and proliferation by fibroblasts was distinctly noticed (fig.33). Extensive fibroblastic proliferation was also observed in some dogs (fig.34). In 2 dogs attempted ossification was also observed (fig.35) indicating the tendency of bone formation. In few cases proliferation of chondrocytes (fig.36) with areas of ulceration of epithelium was noticed. A few sections revealed active sebaceous glands having secretions (fig.37) and hair follicles with disrupted epithelium (fig.38).



Fig.29 : Vertical ear canal ablation with baffle plate - Incisional dehiscence of ear after suture removal - 10th Post-operative day.



Fig.30 : Vertical ear canal ablation with baffle plate –
Normal healing of ear.

TABLE 9. CLINICAL RESULTS OF VERTICAL EAR CANAL ABLATION IN CHRONIC OTITIS EXTERNA OF DOGS

S. No.	Breed	Sex	Age	Duration Of Clinical Signs	Unilateral/ Bilateral	Pre-operative ABST & Culture	Pre-operative Medication	Complication; If any	Results	Remarks
1	German Shepherd	Female	8 years	Since 2 years	Bilateral	Ciprofloxacin Staphylococcus Sps., Pseudomonas sp.	Antibiotics For 7 days	Nil	Good	Nil
2	German Shepherd	Male	7 years	Since 4 years	Unilateral (Right ear)	Ciprofloxacin Staphylococcus sps.,	Antibiotics For 7 days	Nil	Good	Nil
3	German Shepherd	Female	8 years	Since 2 years	Bilateral	Ciprofloxacin Staphylococcus sp., E.coli	Antibiotics For 7 days	Nil	Good	Nil
4	Labrador	Male	11 years	Since 3 years	Bilateral	Gentamycin Staphylococcus sp.,	Antibiotics For 7 days	Nil	Good	Nil
5	Labrador	Male	7 years	Since 3 Years	Unilateral	Ciprofloxacin Pseudomonas sp.	Antibiotics for 7 days	Nil	Good	Nil
6	German Shepherd	Male	8 years	Since 4 Years	Bilateral	Chloramphenicol Staphylococcus sp.,	Antibiotics for 7 days	Healing of suture line by second intention	Good	*
7	Spitz	Male	9 years	Since 2 years	Bilateral	Ciprofloxacin Pseudomonas sp.	Antibiotics for 7 days	Nil	Good	*

* Baffle plate could not be created due to ossification of vertical ear canal

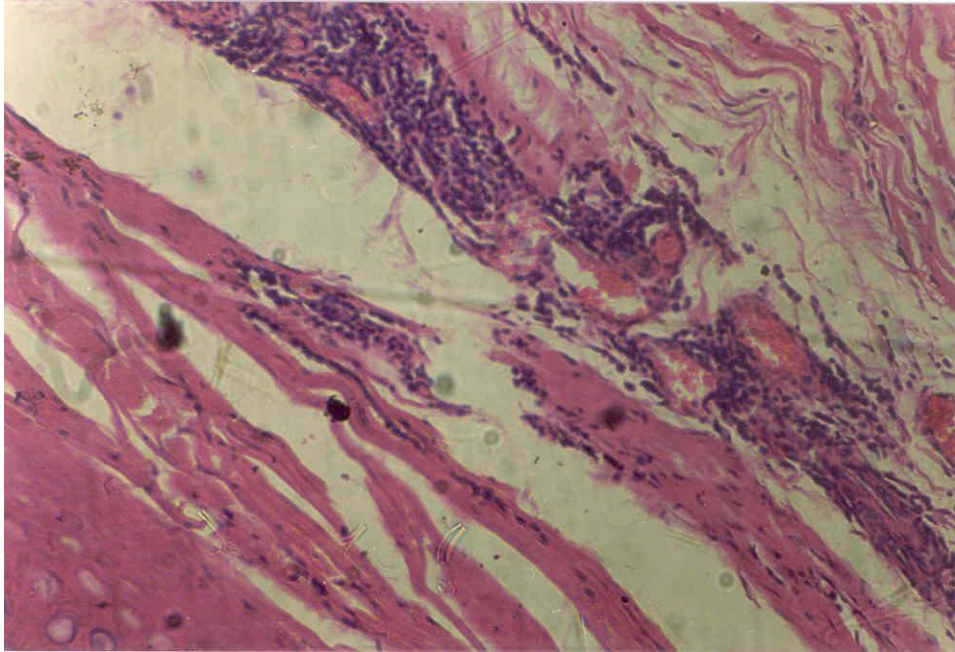


Fig.31 : Microphotograph showing normal cartilaginous structure with mild congestion, round cell infiltration and fibroblastic proliferation (H & E x 160).

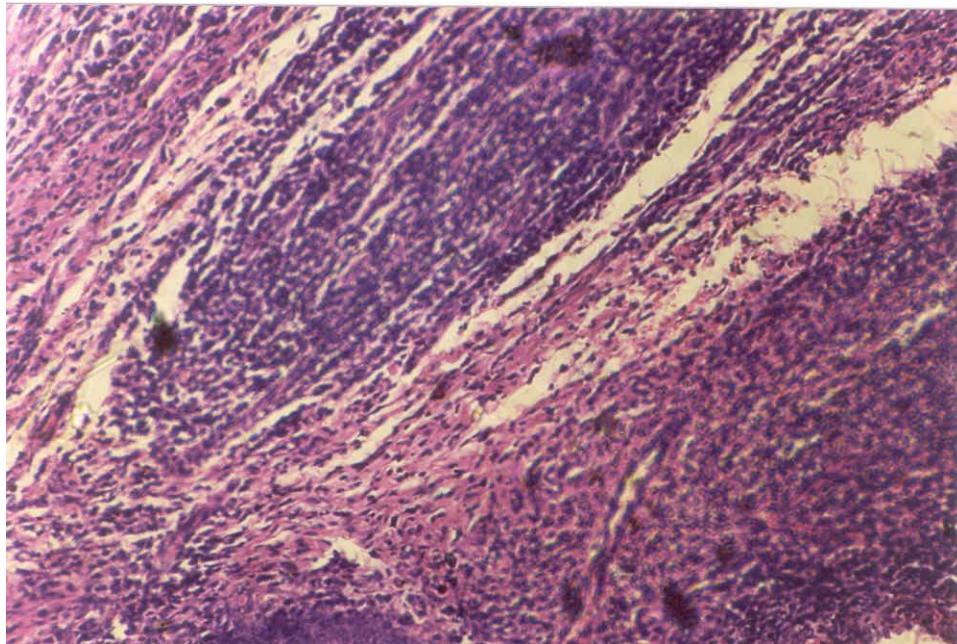


Fig.32 : Microphotograph showing round cell infiltration in the dermal layers (H & E x 160).

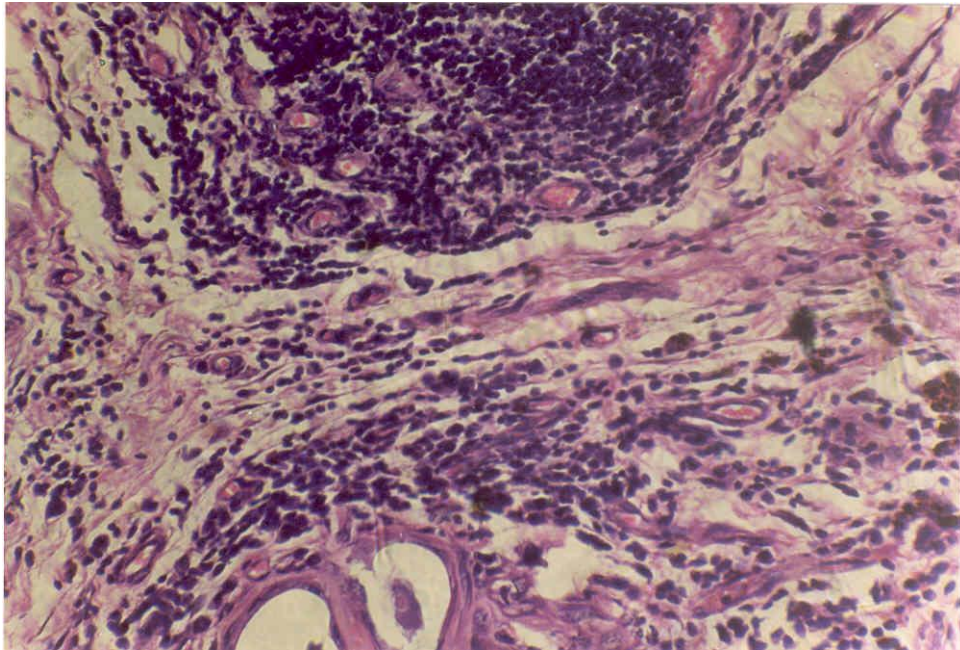


Fig.33 : Microphotograph showing round cell infiltration mild congestion and mild fibroblastic proliferation (H & E x 250).

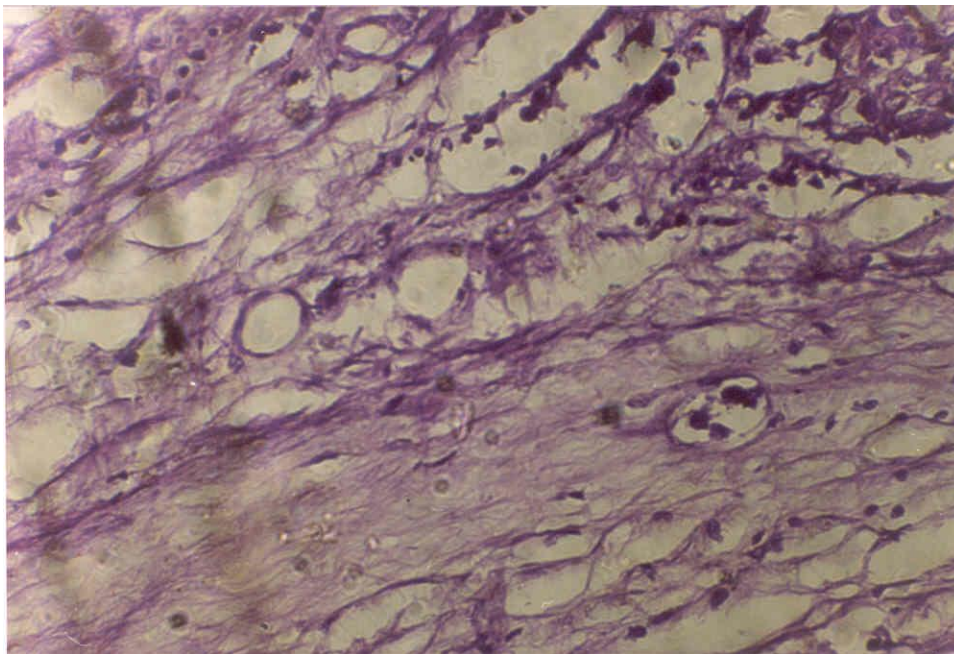


Fig.34 : Microphotograph showing extensive fibroblastic proliferation (H & E x 250).

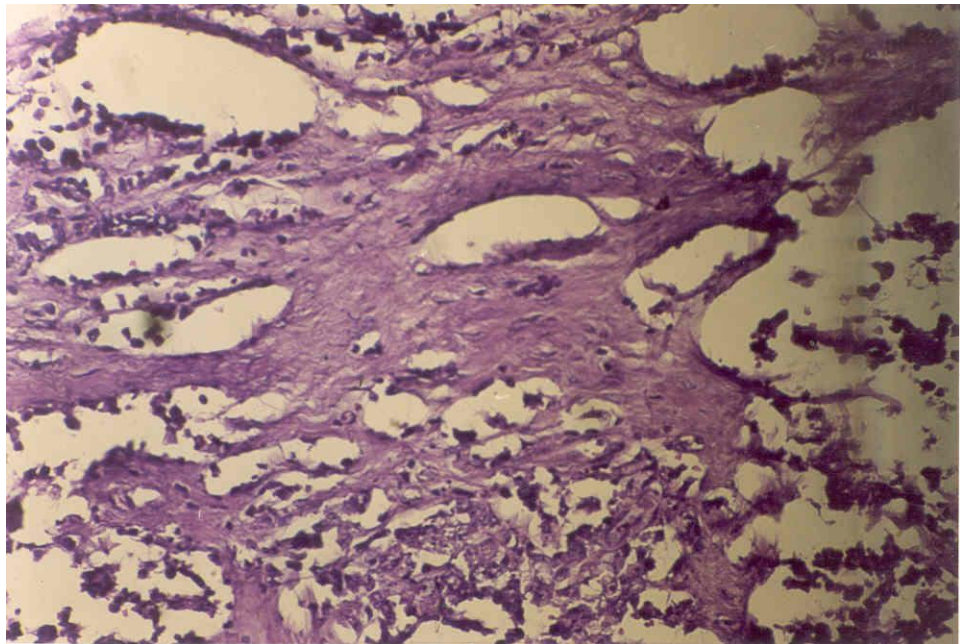


Fig.35 : Microphotograph showing attempted ossification with inflammatory cells (H & E x 160).

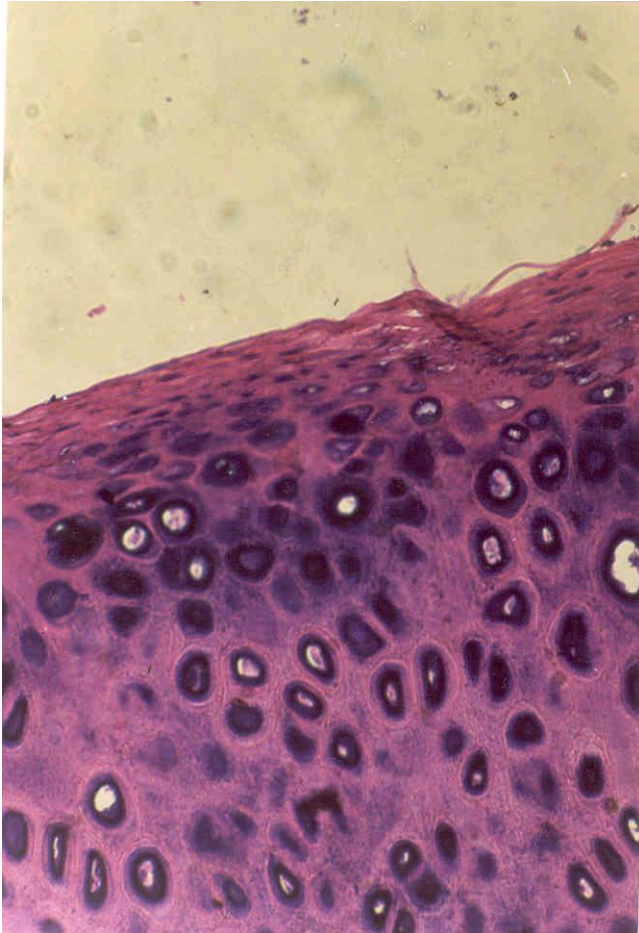


Fig.36 : Microphotograph showing proliferative chondrocytes (H & E x 160).

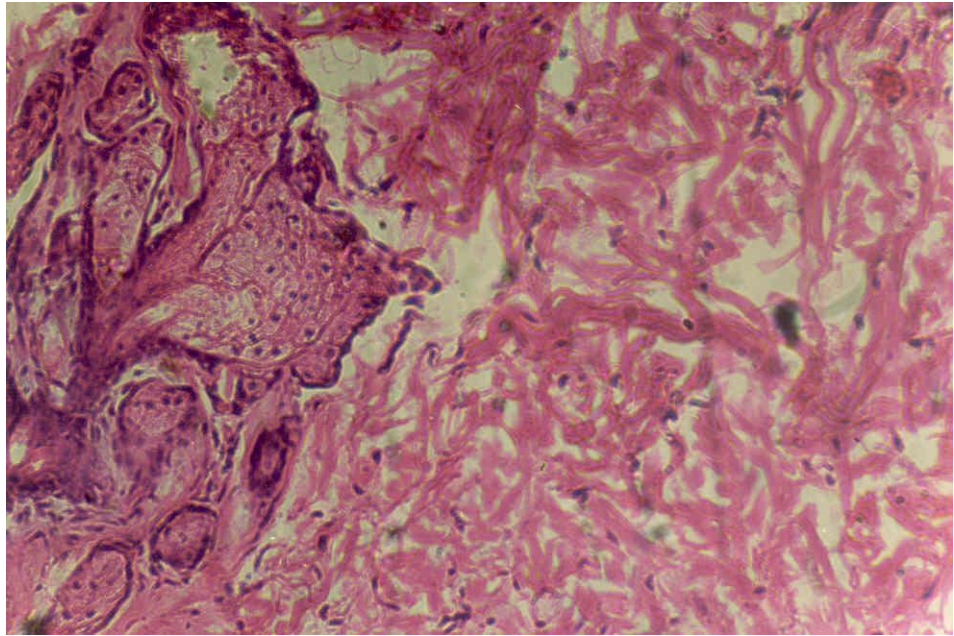


Fig.37 : Microphotograph showing ceruminous glands and hair follicles (H & E x 160).

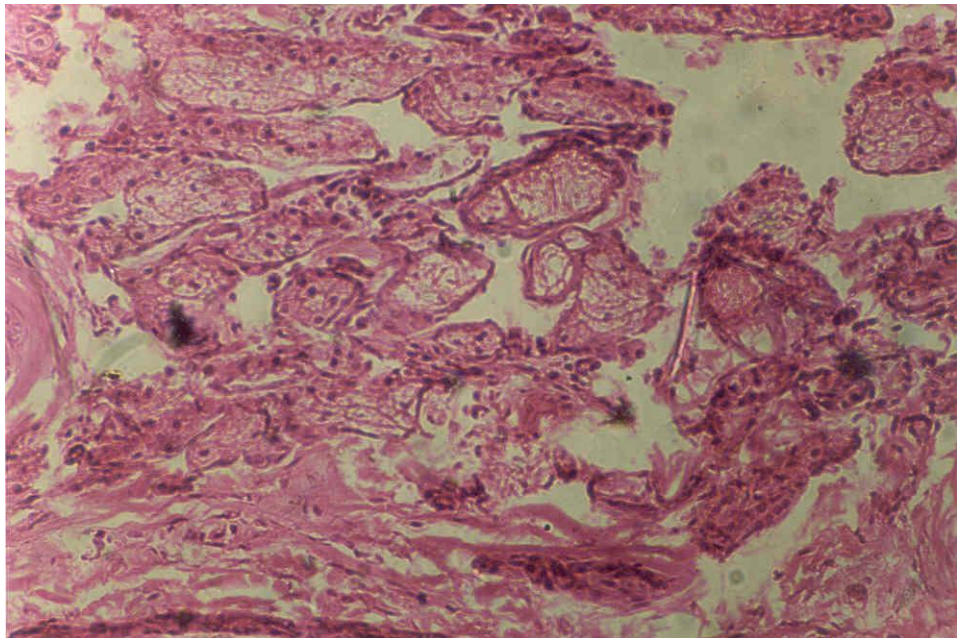


Fig.38 : Microphotograph depicting hair follicles and sebaceous glands with secretions. (H & E x 160).

CHAPTER V

DISCUSSION

Otitis externa is a common disease in dogs accounting to approximately 4 % to 12.5% of all the cases presented for treatment of veterinary hospitals (Bellah, 1997 and Grono, 1980). Medical treatment of the cases of otitis externa is often considered difficult and even frustrating both to the animal owner and veterinarian alike (Logas, 1994). The medical management of otitis externa is probably difficult because of several factors like anatomical features of the canine ear, changes in the microenvironment of the ear canal and also due to poor drainage and poor aeration (Bellah, 1997).

Additionally, in our country, it is a common practice to attempt to treat these cases often without suitable investigations like antibiotic sensitivity test owing to lack of facilities and the costs involved. In addition, in those cases of otitis externa that are chronic, recurrent and associated with ulceration, and proliferative changes in the ear canal, there is general reluctance both on the part of the owner and the veterinarian to undertake corrective surgical operations.

Among the surgical procedures described for treatment of such cases, Zepp's aural resection (Zepp, 1949; Tufvesson, 1955; Harvey, 1980; Bojrab and Renegar, 1981; Gregory and Vasseur, 1983; Knifton, 1984; Bellah, 1997 and Sylvestre, 1998) and vertical ear canal ablation (Harvey, 1980; Siemering, 1980; Turgari and Pinniger, 1986; Boothe and Slatter, 1992 and McCarthy and Caywood, 1992) are commonly performed. These procedures attempt not only to modify the microenvironment within the external ear canal, but also improve

drainage and aeration in the external ear canal (Bellah, 1997; Sylvestre, 1998 and Bojrab and Constantinescu, 1998). These changes brought about by surgical procedures mentioned are curative in themselves. In addition they allow better medication into the ear canal, if need be, in those cases where alleviation of the symptoms of otitis externa is not complete (McCarthy and Caywood, 1992).

In general there is lack of information generated from clinical studies on both medical and surgical management of otitis externa in dogs in India. Therefore the present clinical study was carried out to address the above-mentioned lacunae.

5.1 INCIDENCE

The results of the present clinical study clearly showed that maximum cases of otitis externa (n=39; 44.32%) were encountered in dogs between 3-6 years of age, while the minimum number of cases were seen in dogs above 9 years of age. The results also indicated that the average age at presentation was 5.21 ± 0.27 years for all cases of otitis externa. However the average age of presentation of those cases requiring surgical treatment was found to be 7.07 ± 0.23 years. These findings are in concurrence with those of Grono and Frost (1969) and Little et.al., (1991) who made similar observations. On the contrary, Sharma and Rhoades (1975) stated that the incidence of otitis externa was common in the age group of 1-4 years. Devaya (1993) found no correlation of age with occurrence of the disease.

The incidence of otitis externa in the present clinical study was found to be the highest in the German Shepherd Dog (n= 42; 47.72%) and least in the

Dachshund (n=2; 2.27%). Similar observations were also made by Lane and Little (1986) and Little et.al., (1991). However the results of the present clinical study are in variance with the observations of Grono and Frost (1969) who reported higher incidence in Cocker Spaniel, Labrador, Miniature Poodle, Dachshund and German Shepherd breeds of dogs respectively.

Of the 88 dogs encountered in the present study 59 (67%) were males and the rest were females indicating that otitis externa is twice as common in males as compared to females. This is in contrast to the findings of Tufvesson (1955) and Devaya (1993) who found no correlation between sex and the incidence of otitis externa. However the findings of the present clinical study are in corroboration with those of Grono and Frost (1969) and Little et.al., (1991).

5.2 CLINICAL SIGNS

The various clinical signs in dogs with otitis externa observed in the present clinical study were variable degrees of head shaking, scratching, pain, odour, ear discharge and head tilt. Grono (1980), Bojrab and Renegar (1981), Krahwinkel (1993) and Uchida et.al., (1994) also made similar observations.

In 14 dogs visual examination of ear canal revealed hyperplasia, thickening, ulceration, stenosis and calcification of ear canal. The clinical findings pointed to the chronicity and advancement of the condition and prompted towards insufficiency of medical management in treatment of this condition. Therefore surgical treatment by either Zepp's aural resection or vertical ear canal ablation was contemplated in these 14 cases. It is pertinent to note here that history in all these 14 cases revealed that the condition was

recurrent and all the dogs were previously subjected to several attempts of medical treatment, unsuccessfully at some other hospitals. Harvey (1980), Siemering (1980), Bojrab and Renegar (1981), Targari and Pinniger (1986) and Bojrab and Constantinescu (1998) also reported that the criteria for selecting cases of otitis externa by surgical procedures were hyperplasia, thickening, ulceration, stenosis and calcification of ear canal.

5.3 CULTURAL EXAMINATION AND MEDICAL TREATMENT

The results of cultural examination of ear discharges resulted in isolation of *Staphylococcus* sp., in 51 (58%) cases and *Pseudomonas* sp., and *E.coli* in 24 (22.27%) and 13 (14.77%) cases respectively. Wang (1972), Krogh et.al., (1975), Blue and Wooley (1977), Lund (1979) and Baba et.al., (1981) also isolated the above mentioned organisms in their studies. While the present study indicated that *Staphylococcus* sp., infection was most commonly involved in cases of otitis externa, Akay et.al., (1984) reported that *Pseudomonas aeruginosa* was most commonly isolated. Krogh et.al., (1975), Sharma and Rhoades (1975), Sala et.al., (1983), Devaya (1993) and Uchida et.al.,(1994) reported involvement of yeast like *Malassezia pachydermatis*, *Klebsiella* etc. No such organisms were isolated in the present study.

The antibiotic sensitivity test revealed that Ciprofloxacin (n=31; 35.23%), Gentamycin (n=25; 28.41%), Chloramphenicol (n=22; 25%), Amoxicillin (n=6; 6.8%) and Oxytetracycline (n=4; 4.5%) were effective in inhibiting the growth of the concerned organisms. While Fraser (1961) reported that a combination of Chloramphenicol and Dapsone are more effective in ear infections. Baba et.al.,

(1981) and Devaya (1993) stated that first choice of antibiotic was Gentamycin followed by Chloramphenicol and Ampicillin. The results of the present study deferred from these studies probably because of geographical variations in bacterial profiles.

Although the present clinical study centered on the surgical treatment of chronic otitis externa, selection of such surgical cases resulted in generation of lot of data regarding the medical treatment also. Therefore it was considered prudent to include the very useful data regarding the medical treatment.

The fact that medical treatment by thorough irrigation by sterile normal saline followed by suitable topical and systemic antibiotics resulted in complete remission of the symptoms of otitis externa in 62 (70.45%) of the 88 cases treated pointed to the efficacy of medical management following culture sensitivity tests. Harvey (1980), Gregory and Vasseur (1983) and Bellah,(1997) also made similar observations.

In the present study, although Amoxycillin was found to be sensitive, Amoxycillin-Cloxacillin combination was used because of the reported synergetic effect.

5.4 SURGICAL TREATMENT

5.4.1 Zepp's Aural Resection

In the present study, the fact that all the 7 dogs subjected to Zepp's aural resection recovering uneventfully emphasized the suitability of the technique in treatment of chronic otitis externa. The absence of complications barring one case of incisional dehiscence, which was however, considered

insignificant laid further impetus on the efficacy of Zepp's aural resection in treatment of chronic otitis externa. Tufvesson (1955), Gregory and Vasseur (1983) and Sylvestre (1998) also reported successful surgical treatment of chronic otitis externa by Zepp's aural resection.

5.4.2 Vertical Ear Canal Ablation

The selection of vertical ear canal ablations technique in cases of chronic otitis externa accompanied by hyperplastic changes leading to partial or complete stenosis of ear canal proved apt considering satisfactory and uneventful recovery in all the 7 cases operated. In two dogs operated by this method, the pathological changes especially ossification of the ear canals was so severe that it was not possible to dissect and create baffle plate. This indicated that vertical ear canal ablation technique was useful and successful in even very severely advanced cases of chronic otitis externa. Similar observations were also made by Harvey (1980), Siemering (1980), Boothe and Slatter (1992) and McCarthy and Caywood (1992). In addition, Siemering (1980), Tirgari and Pinniger (1986), Tirgari (1988) and Krahwinkel (1993) further stated that the advantages of vertical ear canal ablation over lateral ear canal resection are removal of all infected, inflamed vertical ear canal tissue, less post-operative exudation and pain.

5.5 HISTOPATHOLOGICAL OBSERVATIONS

Histopathological observations with the presence of severe cellular infiltration, congestion, extensive fibroblastic proliferation, attempts at ossification in the resected portion of the ear canals strengthened the observations made during the clinical examination. The severity of the histopathological changes in the tissues also vindicated the selection of surgical treatment in these cases and the futility of medical treatment, had it been attempted. Ott (1965), Fernando (1967), Fraser et.al.,(1970), Bojrab and Renegar (1981), Hobson (1988) and Menon et.al.,(1991) also made similar histopathological observations in cases of chronic otitis externa.

5.6 CONCLUSIONS

The following conclusions were drawn from the present study:

1. The average age at presentation of otitis externa was found to be 5.21 ± 0.27 years. The average age of dogs that require surgical correction was found to be 7.07 ± 0.23 years.
2. German Shepherd followed by Spitz, Mongrels, Labradors, Dobermans and Dachshunds were found to be most commonly affected with otitis externa in that order.
3. Male dogs are twice as likely as females to suffer from otitis externa.
4. Staphylococcus sp., Pseudomonas sp., and E.coli were implicated in the etiology of otitis externa.

5. Ciprofloxacin, Gentamycin, Chloramphenicol, Amoxicillin and Oxytetracycline were found to be the most effective antibiotics in the treatment of otitis externa.
6. Medical treatment involving thorough irrigation of the ear canal with sterile normal saline followed by topical and parenteral antibiotics for 5-7 as days determined by antibiotics sensitivity test resulted in recovery in 62 (70.45%) of the 88 dogs treated.
7. Cases of chronic recurrent otitis externa accompanied by hyperplasia, ulceration, stenosis and calcification are suitable for surgical correction.
8. Zepp's aural resection proved successful in all the 7 cases of chronic otitis externa with minor complications.
9. Vertical ear canal ablation was found to be suitable in cases of chronic otitis externa especially when they are accompanied by complete or partial stenosis and calcification of the external ear canal.

CHAPTER VI

SUMMARY

The present clinical study was carried out on 88 dogs presented for treatment of chronic otitis externa to the Teaching Veterinary Clinical Complex at Teaching Veterinary Hospital, College of Veterinary Science, Rajendranagar, Hyderabad and Bhoiguda, Secunderabad. The dogs presented for treatment of chronic otitis externa were in the age group of 1-14 years. Among these dogs 59 were males and 29 were females.

Based on the clinical examination and clinical assessment, in 74 dogs (84.09%) where medical management was considered sufficient, they were treated by topical and parenteral administration of antibiotics. Of the remaining 14 dogs, which had signs indicating the necessity of surgical treatment, 7 dogs were treated by performing Zepp's aural resection and the remaining 7 dogs were treated by performing vertical ear canal ablation.

The results indicated that out of the total 88 dogs with chronic otitis externa, 17 (19.31%) were in the age group of 0-3 years, 39 (44.32%) were in the age group of 3-6 years, 21 (23.86%) were in the age group of 6-9 years and 11 (12.5%) were above 9 years of age. The mean age of presentation of dogs with otitis externa was found to be 5.21 ± 0.27 years. For surgical cases the mean age were found to be 7.07 ± 0.23 years.

The study of the breed distribution of chronic otitis externa revealed that a majority of cases of chronic otitis externa were noticed in German Shepherd followed by Spitz, mongrels Labrador, Doberman and Dachshund.

The various clinical signs observed in dogs with otitis externa included variable degrees of head shaking, scratching, pain odour, ear discharges and head tilt. Visual examination of ear canal revealed hyperplasia, thickening, ulceration, stenosis and calcification of ear canals in 14 cases. These cases were selected for surgical treatment.

Out of 88 dogs examined 27 dogs had unilateral ear disease and 61 dogs had bilateral ear disease.

The results of cultural examination of the ear discharges resulted in isolation of *Staphylococcus* sp., in 51 cases, *Pseudomonas* in 24 cases and *E. coli* in 13 cases. Ciprofloxacin was found to be the most effective drug with 31 cases responding to the drug, followed by Gentamycin in 25 cases, Chloramphenicol in 22 cases, Amoxycillin in 6 cases and Oxytetracycline in 4 cases.

Medical treatment comprised of thorough irrigation of the external ear canal followed by topical and parenteral antibiotics as determined by antibiotic sensitivity test. Medical treatment of 74 dogs resulted in alleviation of symptoms in 62 (83.78%) dogs while six dogs had relapse of symptoms after 4-6 weeks. Treatment of these six dogs with the same treatment regimen led to recovery. Six dogs were not available for follow up.

All the seven dogs where Zepp's aural resection was performed recovered uneventfully. Wound dehiscence was observed in one case. All the dogs recovered without any post-operative complications.

All the seven dogs that had advanced chronic otitis externa with symptoms like hyperplasia and complete or partial stenosis of the ear canal were relieved from the clinical symptoms of otitis externa by performing vertical ear

canal ablation. Barring one case of wound dehiscence, no complications were observed in any of the dogs.

Histopathological examination of the resected portions of the ear canal revealed the presence of severe cellular infiltration, congestion, extensive fibroblastic proliferation, and attempts of ossification.

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