Original Article

Pinna is the gateway of Otology

But it demands and receives attention far less than any other parts of the ear To learn Otology how many of us start from the pinna?

●
A Pinna which has not caused any cosmetic loss upon the facial appearance of the person concerned may be called as normal

●
Pinna is loosely called as ear, though it is only a part of it !

●
Pinna is a gate or a door which is ever open.
It does not know how to close by itself !

Believe it or not !

No Pinna is Similar in Appearance to another. But they are not all abnormal. Then what is the definition of a normal Pinna ?

●
Pinna is present in mammals only and not found in any other living species

●
Pinna, though the most exposed part of the ear, suffers so much less than its unexposed parts.

●
Pinna is prominent by its abnormality more than by its normal existence.

Study of Congenital Anomalies of Pinna and the Ecological Influence on it's Development

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Abstract

Pinna is present in mammals only and not found in any other living species. Various congenital anomalies of Human pinna often mimic the appearance of normal pinna of many mammals of lower order. Ecology has been observed to play a role in the development of pinna. Anomalous pinna though frustrating for both patients and clinicians , are mostly amenable to treatment.

Mammals leading a wild life require acuity, localization and quick collection of sound waves most essentially for their survival. They achieve this by quick turning movements of their necks and pinnas.

Man, after social and structural evolutions, has now become free from such demands. The collection of sound waves is not so indispensable for their existence. This has made their pinnas to suffer from disuse, which in turn has made them motionless, their various intrinsic muscles vestigial. However, their neck movement is still retained for the said purpose, converting their pinna into a mere beautifying organ. Human pinna often suffers from various congenital anomalies. In lower mammals, appearances of pinna differ from species to species. **It is interesting to note, when the human pinna undergoes certain congenital anomalies, it mostly mimics the appearances of normal pinnas of one of those species. As if, the pinna after arriving at highest order of evolution and its ultimate shape, often by mistake acquires one of its past appearances.** (See Fig. 1, 2, 3, 4 etc) However, it has been presumed that development of pinna is mostly ecology dependent. It is absent in those, where it would have been an obstruction to the passage of sounds eg whale, Dolphin; Marsupial mole etc with the subsequent loss of its other functions. Ecology also makes the pinna smaller or bigger or into various other shapes for the same reasons. (Hare, Giraffe, Elephant etc)

Anomalous appearances of a pinna, may not be a lone malady. It is known to be associated with various notorious malformations of the middle and inner ear and that of regions derived from 1st and 2nd branchial arches and of various organs of the human body. A reason, why such anomalous appearances should alert the clinicians for an intensive search. It is often found to remain associated with many malformations in constant fashion-producing

Fig. 1 Batear

Fig. 2. Microtia : Found amongst Sea lion leading a dual (both in land and water) life. Inset : Microtia in a boy.

Fig. 3. Walrus : Another example of Microtia in mammal leading a dual life

Fig.4. Above: Polyotia In common Tenrec (a) Considered as normal. Below: Polyotia in man (b) - Considered as anomalous.

certain syndromes. Often extrinsic factors like drugs, viruses, X- ray, radio active agents and steeter band have been observed to produce such deformities. In this study all the above queries have been investigated and answered.

Aims of the study

Two aspects. A. *Clinical Study*. B. *Nature Study*.

A. Clinical Study :

1. To note the number of patients suffering from congenital anomalies of pinna and that of their various types and their percentages.
2. To scan the middle and inner ears of patients suffering from major defects like anotia, microtia with meatal stenosis etc. with deafness, for assesment of structural and functional rehabilitation.
3. To find out the responsible extrinsic factors for such anomalies if any.
4. Finally sex incidences, site prediliction, degree and type of hearing loss, associated deformities, its correlation with any known syndromes and numbers of such patients interested for treatment have also been noted and discussed.

B. Nature Study

1. To find out similies between anomalous and normal pinnas of human and lower mammals respectively.
2. To presume the ecological influences if any on the development of pinna.

Materials and methods

The study was conducted at R. G. kar Medical College and Hospital, Calcutta, West Bengal between the year 1980- 83. Because the sufferer

of congenital defects of pinna, specially those of minor and unilateral type are usually known to remain nonvocal, the pinnas of all the patients attended during the said studies were specially examined. In positive cases, sex, site of lesion, type of deformity and the purpose of their visit were enquired, noted and photographed. Because the major types of such deformities are often known to suffer from other anomalies like cleft palate, polydactylism, renal and genital

anomalies, Facio-mandibulo-cervical deformities etc. such enquiries were also made and recorded. The same patients were also subjected to C. T. Scan to discover anomalies in their meatus, middle and internal ear. The type of mastoids were also noted in addition. Finally, such deformities were compared with the pinnas of lower species. The role of ecology was thought of and discussed.

Result & Analysis

Table - 1

Showing No. of patients studied , No. of anomalous pinna, their sex and site predeliction ; percentages.	
Total No. of cases studied	Total No. of anomalous pinnas. Sex, Site
5000	65 (1.3 %)
Male : 3241 (64.82 %)	Male : 40 (61.5%)
Female : 1759 (35.18%)	Female : 25 (38.5%)
	Bilateral : 49 (75.4%)
	Unilateral : 16 (24.6%)

Table - 2

Showing No. of patients observed with associated anomalies amongst those 65 patients. Types of such anomalies, sex differences.		
Total No. of patients.	Total No. of patients with asso. anomalies	Type of Anomalies
65	4 (6.15%)	1. Polyotia with incomplete cleft palate. -1
	Female -3	2. Unequal size with polydactylism -1
	Male -1	3. Dysplastic pinna with polydactylism -1
		4. Unequal size with polycystic kidney -1

Table - 3

Showing list of major defects, their types and sex incidences ; percentages out of 65 patients studied.			
Types	Total No. with percentages	Sex Incidences	
		Male	Female
1. Polyotia	7 (33.33 %)	4 (19.05%)	3 (14.28%)
2. Microtia	3 (14.28%)	2 (9.5%)	1 (4.9 %)
3. Combined microtia with meatal stenosis	4 (19.05%)	3 (14.28%)	1 (4.9 %)
4. Bifid ear lobule	3 (14.28%)	1 (4.9%)	2 (9.5%)
5. Unequal size	2 (9.5%)	1 (4.9%)	1 (4.9%)
6. Bifid tragus	1 (4.9%)	1 (4.9%)	0
7. Anotia	1 (4.9%)	1 (4.9%)	0
	21 (32.3%)	13 (61.9%)	8 (38.1 %)

Table - 4

Showing list of minor defects, their types and sex incidences ; percentages out of 65 patients studied.			
Types	No.	Sex Incidences	
		Male	Female
1. Batear	21 (48.00 %)	12 (27. 27 %)	9 (20.45%)
2. Wildermuth ear	9 (20.45%)	5 (11.36%)	4 (9.09 %)
3. Darwin's tubercle	6 (13. 63%)	1 (2. 27%)	5 (11.36 %)
4. Hypertrichosis	4 (9.09%)	4 (9.09%)	-
5. Mozart's ear	2 (4.58%)	1 (2.27%)	1 (2. 27%)
6. Preauricular Sinus	2 (4. 58%)	1 (2. 27%)	1 (2.27%)
	44 (67. 7%)	27 (54 .5%)	20 (45. 5 %)

Table - 5

Showing results of Audiometry (Puretone) in cases of major defects with hearing loss.				
Total No. Cases	Types of deafness	Degr of deafness		
		Mild	Mod.	Severe
5 (7.65 %)				
1. Combined Microtia with meatal Stenosis- 4 (6. 15 %)	Conductive type - 4	0	0	4
2. Anotia - 1 (1.4 %)	S- N type - 1	0	0	1

Table - 6

Showing results of C. T. Scan of those patients in Table - 5	
No. of Cases	Results
5 (7 . 65 %)	Total absence of meatus, Middle and inner ear 1 (20%) Meatal Stenosis only 4 (80%)
1. Combined microtia with meatal stenosis - 4	<u>Types of Mastoids</u> Pneumatic - 3 (60 %) Sclerotic - 1 (40%)
2. Anotia - 1	

Table - 7

Showing results of investigations in respect of responsible extrinsic factors		
No. of patients	H/o Positive extrinsic factors	Types
65	5 (7 . 65 %)	Indigenous abortifacients - 3 (60%) Virus - 2 (40%)

Table - 8

Results of investigation in search of any syndromes.	
No. of patients	Type of syndromes
65	Dysplastic Pinna - polycystic Kidney syndrome -1 (1.53%)

Table - 9

Showing total No. of patients found interested for treatment.		
Total No. pts.	Anomalous ear	Interested for treatment
5000	65	11 (16 . 8%)

Results of comparative studies between anomalous human pinna and normal pinna of various other mammals. (See Fig. Batear, Anotia, Microtia, Polyotia, Macrotia, Hairy Pinna).

Some Examples of Anotia

Fig .5. *Macrotia* : Elephant (Inset A baby with *Macrotia*) Nature has provided an elephant a big pinna as they live in deep forest & thus depend on acuity of hearing for their survival

Discussion

In this study following clinical facts have been observed. Out of 5000 patients. studied, only 65 patients. (1.3%) were found to suffer from various congenital anomalies of pinna. Suffering from various minor types (67.7%) were usual, of which males (54.5%) were more than females (45.5%). Bilateral involvement was more (75 .4%) than unilateral (24. 6%). Batear was found to be a commonest type (48%) . The associated congenital anomalies were noted only amongst 4 patients out of anomalous 65 cases studied (6.15 %). In which females were found to predominate (3:1). Polydactylism was found to be a commonly associated deformity and ' dysplastic pinna - polycystic kidney ' was noted as only syndrome in this

Fig. 6. Anotia

**Fig.7. Anotia. Above –Hawaiian Seal
below –Common mole**

series out of various syndromes described in different texts. In contrast to usual belief, the indigenous abortifacients were found to be most responsible extrinsic (60%) factor for such anomalies. Out of 65 deformed pinnas, commandable cosmetic loss not feasible for both structural and functional correction was observed only in one cases (1.4%). Structural reconstruction of all the other problems were somehow possible. This has been further supported by C. T. Scan, in which middle ear cleft, mastoid and inner ear were observed to be structurally sound in 80 % cases. That the aerated mastoids are usually associated with lesser deformity in the middle ear, has also been confirmed in this study.

In the part of the Nature Study - Most of the anomalous appearances of human pinna were found to be similar to that of normal pinnas of other mammals of lower order Ecology has been presumed to have a definite role in the development of pinna, in the determination of its size and shape.

It has been observed to be absent in mammals leading a strict underground or under water life for better transmission of sound waves eg. whale, dolphin, Marsupial Mole, Echidna (Spiny ant eater) etc. It is small (Fig.2. Microtia) amongst those, leading a dual life i. e. both land and water eg. seal, Rhino, Hippopotamus etc. Presumably it helps them to collect the sounds while on land and does not obstruct while they are under water. The pinna is found to be small also amongst tall and long necked mammals eg. Giraffe, Camel etc. who depend more on vision than hearing for survival. It is large amongst mammals of short stature eg. Hares, (Fig.4) obviously to have better collection of sound.

In conclusion, with the advancement of otomicrosurgery, plastic surgery, and imaging techniques, scope of structural reconstruction of congenital anomalies of pinna are no more so frustrating as it was in the past. The C. T. scan report of this particular series has also prompted

Fig. 8. Anotia : Striped Dolphin

Fig. 9. Anotia : Inia or Amazon Dolphin

Fig. 10. Example of Hairy Pinna

Fig. 9. Giraffe. A long stature mammal. (Nature has provided with small pinna as they depend more on vision for survival)

Fig. 11. Hare. Short Stature Mammal (Nature has provided them with big and mobile pinna as to facilitate better collection of sound wave, essential for their Survival)

us to think so. Since the series is small and since all the patients of this series could not be subjected to specialised audiological examinations, genetic counselling and otomicroscopic check up to note the functional aspects of the middle ear, the actual magnitude of the problem still remains very much unassessed. However the study is still in progress, specially in respect of recognition and feasibility of functional reconstruction of the congenitally deformed middle ear, which when known and conquered shall bring about a total change in the perspective of this challenging condition.

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Acknowledgement

My regards to Suptd. and Director of R. G. Kar Medical College & Hospital, Calcutta and Zoological Survey of India, West Bengal respectively for allowing me to utilise their institutional records. My thanks also to Dr. Indranath Kundu, Dr. Chandan Chakraborty, Dr. Kallol Pal and Mrs. Jaya Sen Zoologist for helping me in various ways in preparing this paper.

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