Neglect has often led to serious consequences like deafness. The ear is not only an organ of hearing, but plays a very important role in maintaining the physical balance of the body. Our day to day functioning would get considerably hampered if we lose even one of our five senses. The numbers of cases of ear problems have been steadily increasing, most of which are of hearing loss. In a recent study conducted at the onset of World Deafness Day on September 24th, “Hearing Loss” has been declared as the number one disability across the world. In this report it is estimated that approximately 500 million people worldwide suffer from some form of hearing loss. A third of this figure could be attributed to loud music, noisy workplaces and surroundings. Awareness is on the rise but still inadequate.

In the past, people have been avoiding to consult a doctor unless pain became unbearable. They would rather prefer to try home remedies but this has lead serious problems. At an average, 15-20% patients come with the common problem of discharge from the ear. But it has been noticed that otitis externa is a more common disorder in high and middle socio-economic class. In lower income families, Otitis Media or perforation in the eardrum is a common ear disorder.

### Construction and Working of the Ear

Before going into actual ear problems, basics of the human ear need to be studied upon. The human ear is basically divided into three regions: Outer Ear, Middle Ear, and Inner Ear. The human ear also consists of eardrum between outer ear and middle ear. The **Outer Ear** consists of the pinna or external ear, the meatus or ear canal, the tympanic membrane or the eardrum. The **Middle Ear** consists of three ossicles bones the Malleus or hammer, the Incus or anvil, the stapes or stirrup. The **Inner Ear** consists of the cochlea, auditory nerves.
Sound waves collect in the Pinna. Thereafter these waves pass through our Ear Canal and cause our Eardrum to vibrate. This vibration is in turn transmitted in to the Inner Ear by the chain of bones in the Middle Ear. The vibration of the chain of bones in the Middle Ear causes the fluid within the Cochlea to move, resulting in the back and forth movement of the tiny hairs (receptors) on the inner Cochlear surface. When the tiny receptors move they send a signal along the auditory nerve to the brain. The brain interprets this signal as the sound.

TYPES OF HEARING LOSS

Hearing loss can be seen in one of the region of the ear or in more than one region that is outer ear, middle ear, and inner ear. There are basically three types of Hearing loss.

- Conductive Hearing Loss:
  Sound vibration is not conducted into the Inner ear.
- Sensorineural Hearing Loss:
  Although the vibration reaches the Inner Ear, the electrical impulse is not generated appropriately.
- Mixed Hearing Loss
  Both the above losses are existent.

India is a very populous country (estimated 1.3 billion plus population) so the number of deaf people can not be definitely estimated. It is known to be in the millions - some estimates are as high as 60 million (7.8%).

MIDDLE EAR DISEASES

There are 31.70 million (52.84%) persons out of 60 million deaf persons of India suffering due to various types of middle ear diseases like as:
➢ **Otosclerosis**

It is defined as abnormal bone growth in the ear, eventually resulting in hearing loss. It can be an inherited disorder, resulting in abnormal hardening of bone in the middle ear and sometimes inner ear. There is 10.19 million (32.14%) out of 31.70 million suffering from otosclerosis diseases in India.

➢ **Cholesteatoma**

Cholesteatoma is a disease of the ear in which a skin cyst grows into the middle ear and mastoid. There is 6.42 million (20.24%) out of 31.70 million suffering from cholesteatoma diseases in India.

➢ **Chronic Otitis Media**

Otitis media means inflammation of the middle ear. The inflammation occurs as a result of a middle ear infection. It can occur in one or both ears. Otitis media is the most frequent diagnosis recorded for children who visit physicians for illness. There is 12.45 million (39.30%) out of 31.70 million suffering from chronic otitis media diseases in India.

Rest of 2.64 million (8.32%) out of 31.70 million suffering from various other types of middle ear diseases in India.

**TREATMENT OF MIDDLE EAR DISEASES**

**Surgical Treatment**

For many years surgical treatment was instituted in middle ear diseases primarily to restore sound conduction, to control infection and to prevent serious complications. Changes in surgical techniques now have made it possible to reconstruct the diseased hearing mechanism in most cases. Various tissue grafts may be used to replace or repair the eardrum. A diseased ear bone may be replaced by middle ear prosthesis. Middle ear diseases can be treated using various types of surgical treatment/procedures like as Ossiculoplasty, Stapedioplasty, and Myringoplasty.

The goal of surgical treatment is better hearing, most typically for conversational speech. Ossiculoplasty/Stapedioplasty surgery is being
performed to improve or to maintain the conductive portion of hearing loss. The aim of ossiculoplasty/stapedioplasty surgery is to reconstruct the malfunctioning ossicular chain (chain of three bones i.e. Malleus, Incus & Stapes) in the middle ear cavity. Myringoplasty surgery is performed to ventilate the middle ear, to prevent fluid from building up and to prevent infections in the middle ear cavity. All the above mentioned surgical procedures take about an hour’s time and in most cases patients are discharged after 24-36 hours.

During the 1960’s in the earliest stage of the development of surgical treatments, attempts were made to use biological materials such as cartilage or the remnants of the ossicular chain to create ossicular replacements. Such materials were termed auto-graft and homo-grafts materials since they were obtained from the person and donor respectively receiving the treatment.

Work in developing superior implant materials was continued until the 1970’s, when bioactive materials were developed. Their name comes from their chemical structure, which promotes chemical adhesion between the tissue and the implant, effectively eliminating the need for Auto- and Homo- Grafts.

From 1970 to up till now, various types of material have been using for ossicular chain reconstruction like as Gold, Stainless Steel, Platinum, Hydroxyapatite, Teflon, Polyethylene, Glass Ionomer Cement, and Titanium.

But recently the new trend starts to perform surgery of Ossiculoplasty, Stapedioplasty, and Myringoplasty with **Titanium** based Middle ear implants. Titanium implants are extensively used in cardiovascular, spinal surgery, orthopedic and dental surgery as well as in reconstructive and plastic surgery.

**TITANIUM – THE METAL OF CHOICE**

The selection of titanium for implantation is determined by a combination of most favorable characteristics including immunity to corrosion, high bio-compatibility, strength, low modulus and density and the high capacity for joining with bone and other tissue - Osteointegration. Animal experiments in western countries have revealed that the Titanium may be implanted for an extensive length of time. Histopathological examinations have failed to reveal any cellular changes adjacent to titanium implants. And also careful examinations of tissues adjacent to titanium have revealed neither giant cells nor macrophages, nor any other signs of inflammation. Due to these reasons, Titanium is rapidly becoming the “metal of choice” for many medical applications as well for Ossiculoplasty, Myringoplasty surgeries. Also Patients with Titanium medical implants may undergo for MRI-investigations without any significant adverse effects. Titanium fulfills all needs for
perfect sound conduction from outer ear to inner ear and also accomplishes all requirements for myringoplasty surgery, is become more favourable material as ear surgical treatments.

What needs to be done?

ENT surgeons, primarily in India don’t use Titanium based Middle Ear Prosthesis owing to their cost. All Indian requirements of titanium based middle ear prosthesis are being fulfilled by international companies. That’s why Titanium Prosthesis is very costly in India.

We have been researching on the designing and manufacturing of titanium based middle ear prosthesis in India. The organization has been successful in bringing down the cost of such Middle Ear Implants by a mind-boggling 75% and that too without making any compromise over the International Quality Standards.

We also intend to develop other similar Implants in the ENT space in the time to come. The primary goal of the organization is to provide top quality healthcare to the Indian citizen at the most affordable standards.

We are constantly in the pursuit to develop new instruments, implants and equipment and also to upgrade the existing technology to new levels in the ENT space. Our aim to inspiring patient for splendid healthcare. We believe that a healthier India is going to be a better country. As the proverb goes “Health is the ultimate Wealth”.