Customized Earpiece for Precordial Stethoscope

George Bailenson, D.D.S.*

In modern pediatric anesthesiology continuous monitoring of the patient is essential for the safe conduct of the anesthesia. Artificial metering of oxygen, the host of new anesthetic agents and techniques, and assisted or controlled respiration can cause sudden critical changes in the status of the patient. The newer halogenated agents may cause abrupt cardiac incompetence either through direct myocardial effect or by strong parasympathetic action. Effects on respiratory rate, depth and rhythm must also be watched.

Monitoring devices, intelligently used, constitute the anesthesiologist’s armamentarium in the detection of effects of anesthetic agents on the patient. Complicated electronic devices with their confusion of wires and machinery may distract the anesthesiologist. Blood pressure readings vary with the age, height and weight of the child. Many temporary variations occur before the more stable levels of adult life are attained. Varying length of the upper arm or thigh make proper determination of cuff width difficult and may result in erroneously high or low readings.

The use of a precordial stethoscope is the simplest method of monitoring the changes in the intensity of the sounds, rate and rhythm of cardiac and respiratory function. The pediatric anesthesiologist must observe every heartbeat and every breath if he is to conduct anesthesia safely.

This is most reliably done with a precordial stethoscope strapped to the chest.

During an anesthetic management of several hours duration the earpieces of a conventional binaural stethoscope can become so uncomfortable as to be painful to the wearer. The anesthesiologist is shut out from the operating room and remains alone in his world of heart sounds.

Monaural stethoscopes with molded earpieces have obviated these difficulties. Professional custom molding, however, may cost as much as twenty five dollars or more. Ready-made earpieces of arbitrary form and dimension sacrifice acoustic accuracy.

It is within the capabilities of dentists with their knowledge of impression taking and duplication of anatomic structures to fabricate such earpieces. A method for fashioning such a stethoscope using standard dental materials and techniques will be presented.

The earpiece should fill the concha, or main cavity of the external ear; extend far enough anteriorly to fit under the tragus; and far enough posteriorly to fit under the curved prominence of the anti-helix. Retention is attained through snug fit under the cartilages and ligaments of these structures. A projection should extend at least one centimeter into the external auditory canal.

The impression of the ear from which the earpiece is made must duplicate these structures accurately enough to assure retention and proper acoustics. Standard dental impres-

*Coordinator, Dental Anesthesiology Residency Program, Peninsula General Hospital, Edgemere, New York.
sion material produces an eminently suitable result.

A jar cover of sufficient diameter to cover the area is used as a tray. The entire external ear need not be included.

A moistened cotton pellet should be inserted well into the external auditory canal. With the subject's head resting on the contralateral side and the ear to be recorded facing upward, a small amount of alginate is daubed into the canal with a finger and then some more placed into the concha. The jar cover, filled with alginate, is inverted over the ear and held in place until the material sets.

The impression separates easily from the ear, and usually removes the cotton with it. (Fig. 1)

![Alginate impression of the ear extending into the external auditory canal.](image)

The excess alginate that has spread beyond the jar cover is trimmed off, the impression boxed with adhesive or masking tape, and the model poured in artificial stone.

Waxing a pattern for the earpiece is accomplished by filling the entire concha with baseplate wax and smoothing the exposed surface. To facilitate removal from the ear, a handle is added by attaching one end of a roll of wax, 10 mm. long by 4 mm. in diameter, to the superior end of the wax-up so that it projects straight upward as the model lies on the bench.

The model should be flasked as any denture and processed with hot cure clear acrylic. After breaking the cured earpiece out of the flasking, it should be trimmed only enough to remove any corners from the edges and to smoothen surface irregularities. It is imperative that the surface to contact the inside of the ear be reduced only an absolutely minimal amount to retain a snug fit. Polish lightly with pumice and high shine compound, again, removing only a minimal amount of material.

Using a fissure bur or a Peeso root canal bur, a channel should be cut through the earpiece to allow air movements in the stethoscope to reach the eardrum. Start this channel at the end of the projection that fits into the external auditory canal and drill through to the external surface of the earpiece. The heat cured clear acrylic is transparent enough so that the course of this channel can be visualized as it is drilled.

The plastic tubing from an intravenous infusion set serves well as the tubing for the stethoscope. A short piece of metal tubing, such as can be obtained from a discarded saliva ejector, is cemented into the outer end of the channel cut through the earpiece to serve as a connector for the plastic tubing. The metal tubing should be bent to point downward as the earpiece is in use. (Fig. 2) The plastic tubing can be glued to the metal tubing or tied to it with orthodontic ligature wire. The bell end, borrowed from another stethoscope, or purchased separately from a medical
supply, is attached to the other end of the plastic tubing.

Properly fabricated, such an earpiece is easy to insert into the ear, will not fall out, and can be worn comfortably for hours. Heart and respiratory sounds can be clearly monitored throughout the anesthetic management while freeing the anesthesiologist's hands for other tasks and allowing the other ear to pick up sounds from the room. The tubing can be made long enough so as not to restrict the movements of the wearer.

Profound respiratory or circulatory depression rarely occur if the anesthesiologist is alert, detects early depression of the vital signs, and adjusts the inspired concentration of the anesthetic.

**Heidbrink Award**

The Heidbrink Award is the highest award given by the American Dental Society of Anesthesiology, to an individual who has made a significant historical contribution to Anesthesiology in Dentistry.

This year, for the first time, it was awarded to other than an American, Dr. S. L. Drummond-Jackson of London, England.

It is to the credit of our distinguished recipient that he is still youthful and exuberant, although he has received this honor for an historical contribution that spans over three decades, since his interest in Pain Control in dentistry dates back to the early 1930's when he was a very young man.

His major historical contribution to all of dentistry was his early recognition that the ambulatory dental patient was often too fearful of dental treatment to be satisfied with the regional anesthetic agents alone and that something new and different was needed to allay this fear.

His early work with intravenous barbiturate anesthesia predates the use of Pentothal in the United States, by the distinguished Dr. Lundy, and was an important historical contribution to Pain Control.

It is important for all our well trained dentist anesthesiologists and for all dentists to have recalled to them the fact that there were pioneers who had recognized very early the problems of dentistry, faced the unknown, conceived an idea, and courageously gave the new idea a push.

It was a great honor to present this award to Dr. S. L. Drummond-Jackson, precisely because of this historical work in Pain Control.