SIDE I
OPERATION —
Supervised surgical operation on a small boy with a cyst in his neck

SIDE II
STETHOSCOPE SOUNDS
Band 1: Heart Murmurs and Lung Sounds —
A Woman with Rheumatic Heart Disease
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Band 7: Heart Murmurs and Lung Sounds —
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SOUNDS OF MEDICINE
OPERATION RECORD

Each of us can anticipate having a surgical operation some time during his life, but the event has been unnecessarily clouded with mystery and drama. This tape recording on a typical routine day in a modern hospital operating room presents an operation for what it is. An event important to the welfare of the individual but not a dangerous tour de force with flashing scalpels and great psychological tension.

The patient is a small boy who, due to an abnormality in growth has had a cyst in his neck since birth. The cyst is about the size of a hen's egg. If left in position, it is likely to become infected or to enlarge and block the windpipe or the large arteries passing to the brain. The idea of the operation is to cut out this undesirable growth without injuring important tissues closely adjacent to it.

A young surgeon is performing the operation under constant supervision from an older more-experienced man who has done this type of procedure many times before. The patient is deriving benefit from the experience of two surgeons, but at the same time the seasoned experience of the older physician is being relayed to the youthful medic in a teacher-apprentice tradition basic to the advance of medicine. The relaxation of these surgeons may shock the layman accustomed to the Hollywood version of an operating room, but relaxation and humor are far better than tension in safely caring for a human in this situation.

The child is asleep under gas anesthesia. The skin over the cyst has been cleaned and draped with towels. Immediately after the incision is made in the side of the neck, the offending cyst is seen by the surgeons. Here the elder man begins to teach...
by explaining how the tissues may be safely divided by "spreading and cutting" with a pair of scissors. He knows the exact position of this type of cyst in relation to the carotid arteries. The idea is to remove the cyst from its buried position between the arteries down to the throat lining beneath the jaw. The operation proceeds carefully but on occasion the young surgeon is needled in a light manner about "knowing anatomy" or about "picking and scratching" the tissues in the wound when he is somewhat hesitant about making the sharp precise cuts which the body can knit in the easiest way. Later the enthusiasm of the artisan is detected in talk about a serious operation being "nice" or "lots of fun." It is also satisfying to know that a successful operation here will result in a complete cure in the patient's disease.

As the removal of the cyst proceeds deeply into the neck, problems arise. The young surgeon is admonished to remain close to the cyst with his cuts in order to avoid injury to normal structures. The illumination in the deep wound is poor, and the spotlight must be adjusted constantly. At one point, fragile tissue of the cyst is broken. The experienced surgeon knows that this is actually a minor problem and occurs frequently during this type of operation. The deeper areas of the wound must be exposed with retractors which pull the outer tissues to one side.

Finally the deepest limit of the cyst is exposed and the growth is removed completely. The surgeons decide that a stitch ("a stick-tie") should not be placed deep in the wound because the advantage of closing the communication between the cyst and the throat is outweighed by the danger of introducing a needle and thread near the arteries. Consequently a small piece of rubber membrane is placed in the wound for a few days while the body closes the communication with scar tissue. Details of the repair of the wound are discussed, and the younger man is left to close the defect by stitching tissues together just beneath the surface of the skin.

The child had no difficulties after operation and left the hospital in three days. There is no possibility of the cyst regrowing. So, with the expenditure of four days of the child's life, a little pain, and the concerted efforts of numerous doctors and nurses, a dangerous growth has been removed and the possibility of serious infection or strangulation avoided. This is the only valid drama of a surgical operation.
STETHOSCOPE SOUNDS

It is intriguing to think that the internal organs, hidden in darkness through the years of our lives, function automatically and efficiently day and night to preserve the welfare of the individual as he thinks man's thoughts unaware of their presence. Certain organs produce sounds in their work. Basically the sound is produced by the motion of some fluid or gas through the channels of the organ. In every instance these sounds may be heard with the stethoscope, and variations in the quality of the sounds are useful to the physician in diagnosing disease.

The "lub-dub" sound of the normal heart beat is produced by the opening and then the closing of the thin tissue valves of the heart. Normally blood passes through the heart in silence because of the smooth contour of the cardiac chambers. When this contour is not smooth due to a disease process, or when abnormal amounts of blood must pass through the heart due to sickness, the vibration of this abnormal eddying process is transmitted to the surface of the body as a swirling noise or murmur superimposed upon the normal valve sounds. Such a murmur, due to rheumatic inflammation of a heart valve, is heard in this first patient here. Because of overwork, the heart beat is irregular. In the last patient the heart muscle is actively inflamed and is able to do its work only by beating at a very rapid rate.

Air moves in and out of the lung passages with each breath to produce a sound signal. In the presence of pulmonary inflammation or congestion, the air must pass through fluid which has accumulated abnormally in the air passages. The resultant bubbles of "rales" which have characteristic features of pitch. Alterations of tone and intensity in the breath sounds indicate the presence of consolidation of lung tissue in pneumonia or the cavities produced by tuberculosis.

As food and gas are transferred down the bowel passages, a gurgling type of sound may be audible. The character of this sound indicates how active or silent the bowel motion might be. The presence of obstruction may be diagnosed when the sounds are abnormally high in pitch due to increased pressure within the bowel or are overly active as the bowel attempts to force intestinal contents past the obstruction. This abnormal type of sound is heard when the bowel is obstructed due to adhesions or cancer. Equally ominous is the complete silence of the bowel when peritonitis is present.

Tape recordings from a number of patients represent here a variety of such alterations. Although the sounds have been there during all of man's existence, the historical evolution of techniques for eliciting them makes a fascinating background to the prosaic thumping and prodding of the modern physician.
The ancient Greek physician, Hippocrates, described a sound of "bubbling vinegar" which could be heard in the presence of an infection in the pleural space surrounding the lung. Although the sounds were known to exist and were known to be useful to physicians after 800 B.C., the listening for them did not acquire much vogue in the medical profession because it involved applying an ear directly to the patient's body. Entirely aside from the immodesty required for such an act, the extreme body filth of the average patient has been well documented by medieval writers as a deterrent to such a method of examination.

It remained for a French physician, Rene Theophile Hyacinthe Laennec, to effect a compromise between the physician's sensibilities and the patient's welfare by inventing the stethoscope in 1816. This enabled the physician to stand at some distance but listen to the sounds of the internal organs.

Current rumor had it that Laennec was forced into the discovery by an immediate need. Presented with a female patient with considerable embonpoint requiring examination in intimate areas of her chest, he was immediately reminded of a current children's game -- listening with the ear placed against one end of a board to hear a pin scratching at the other end several feet distant. In his own words:

"... The age and sex of the patient forbidding the type of examination of which I have just spoken, immediate auscultation, I happened to recall a familiar fact of acoustics, namely that if one places his ear at the end of a piece of timber, he can hear very distinctly the scratch of a pin at the other end. I was as greatly surprised as I was pleased to hear the heart beats much more clearly and distinctly than I had ever been able to hear them through the immediate application of the ear...."

This little-known prototype of the modern stethoscope has been neglected by the do-it-yourself diagnosticians of today who could be evaluating their own illnesses at home with the use of a writing pad. After numerous experiments, Laennec finally evolved the original stethoscope, which was "a cylinder or wood, an inch and a half in diameter and a foot long, perforated longitudinally by a bore three lines wide, and hollowed out into a funnel shape to the depth of an inch and a half at one of the extremities."

With this crude cylinder, Laennec made tremendous contributions to the diagnosis of disease, forming most of his publications from the findings in diseased patients in the charity hospitals of Paris. It is a little step from his wooden tube to the chromium-plated stethoscope of today, which has none of the acoustical excellence of his device but is more portable in the physician's bag.

The common medical practice of percussion (or "thumping" on the chest) had an equally checkered origin. Its inventor, Leopold Auenbrugger, was born in 1722, the son of a tavern keeper in Graz. As a boy he became adept at the hostler's practice of evaluating the amount of wine contained in an oaken cask by tapping down the side of the barrel until a change of percussion tone indicated wine rather than air beneath the tapping finger. He went on to become physician-in-chief of the Holy Trinity Hospital in Vienna. In 1761, the wine-barrel experience was translated to the human body in a classic publication, "Inventum Novum ex Percussione Thoracici Humani, ut Sign Abstruso Interni Pectoris Morbos Deteqendi." Here Auenbrugger proposed that the chest of a healthy subject, when struck, sounds like a cloth-covered drum. He then proceeded to outline his special method of percussion by striking the chest with the finger-tips. A muffled sound or one of higher pitch than usual indicated the site of a disease condition in the underlying lung.

This great contribution was snubbed by contemporary physicians. It did not become current in medical examination until after 1808, when the French physician, Corvisart, popularized the technique and gave Auenbrugger full credit for the discovery. Unfortunately Auenbrugger had died one year previously in relative obscurity. It is interesting to note that he had shown considerable interest in the music of the period. At the behest of the Empress Maria Theresa, he wrote the libretto of an opera, "Der Rauchfangkehrer" or "The Chimney Sweep", composed by Salieri, but could never be influenced to repeat the performance, always maintaining that "one was enough."
The paper recordings from top down are (a) a sound recording taken with a microphone over the heart. The two heart sounds can be seen. The small one is the first sound which denotes the valves opening as the heart starts to contract. The higher "pip" is the second sound, denoting the valves closing as the heart relaxes. There is no murmur appearing on this tracing. The vibrations are extraneous noise. The limiting factor in this recording is the paper recorder, with a natural frequency of around 45 cps with a high damping coefficient.

(b) the two center tracings are electrocardiograms, which are simply the pips made by the electrical currents passing through the body after being generated by the heart as it initiates its beat. The contraction of muscle starts as an electrical phenomenon and this is the potential associated with heart contraction.

(c) the bottom tracing is a ballistocardiogram, which is a record of the very tiny movements the body makes in recoil to the muscular contraction of the heart.
FX601 SOUNDS OF SEA ANIMALS Vol. II. Florida. This tape contains over twenty oceanic sounds produced by several species of fishes and the sea cow known as the dugong. Narrated by W. N. Kellington, Oceanographic Department, University of Florida, State University of New York at Stony Brook, Ocean Research Institute of the University of Tokyo, and Nippon Oceanographic Corporation. Duplicating Effort: Field recording by Nippon Oceanographic Corporation. Distributed and manufactured by POLYGRAM RECORDS CORPORATION.

FX661 SOUNDS OF FREQUENCY: The purpose of this record is to show a phenomenon which recent playing equipment has made possible; sound waves which, because of their frequency and distance of source, cannot be heard by normal human ears. The record includes five different frequencies, each of which represents a fraction of a human ear's threshold of hearing.


FX676 SOUNDS OF FREQUENCY: For Surf and Surgical Pneumonia: The Doppler Effect. Fundamentals and Overtones, by Dr. Adolfo G. Cavers. Backstage, Front porch before the Tree, 6161.


FX700 SOUNDS OF FREQUENCY: For Surf and Surgical Pneumonia: The Doppler Effect. Fundamentals and Overtones, by Dr. Adolfo G. Cavers. Backstage, Front porch before the Tree, 6161.


