

Common ENT Examination Equipment

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1.1 General Examination Equipment

Currently, basic Otorhinolaryngology equipments include: light source, frontal mirror (headlight), otoscope, tuning fork, anterior rhinoscope, posterior rhino-scope, indirect laryngoscope, gun-shaped forceps, geniculate forceps, cerumen hook, spatula (tongue depressor), spray bottle or watering can, etc.

1.1.1 Frontal Mirror

Frontal mirror is a round concave condenser, it's generally 7.5 cm in diameter, 25–30 cm in focal length and about 1.25 cm in central peephole. It is used at bedside in operation. Its focusing is the main function for application (Fig. 1.1). The light source is projected onto the frontal mirror surface. After the light is reflected and focused on the inspection site, then inspectors observe the focused area through the mirror hole (Fig. 1.2).

Before wearing the glasses, firstly, adjust the tightness of the double-spherical joints appropriately to ensure the mirror flexible and not slippery to fall down. Secondly, wear the frontal mirror over the head and straighten the double spherical joints to ensure the mirror and the frontal plane parallel to

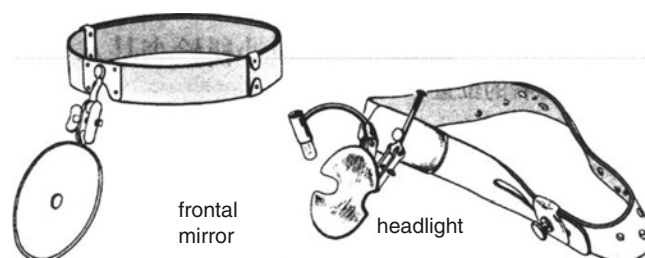


Fig. 1.1 Frontal and headlamps

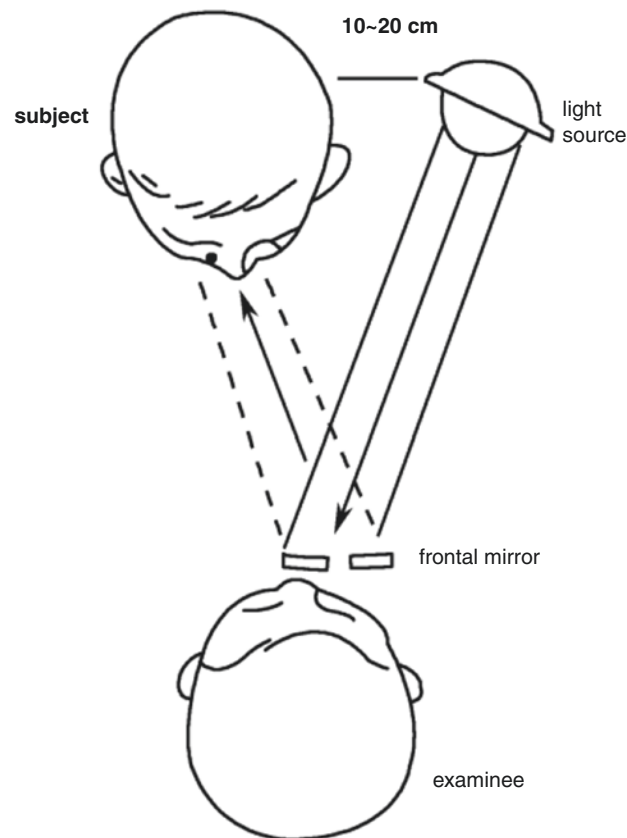


Fig. 1.2 Light

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the right eye or the left eye of the examiners. Thirdly, set the light source on the same side of the mirror, 10–20 cm above the ear of the examinee, to ensure that the light is projected onto the mirror surface. Finally, adjust the mirror to focus the reflected light on the examining site.

The examiner's sight line should be directly aiming at the reflected focal point for examination through the mirror hole.

To use it correctly, several points should be noticed:

1. Ensure the light focus, the sight line, the mirror hole in a line;
2. Suitable focal length, about 25 cm, adjust the projection of the light source and front mirror of the reflective angle, and adjust the patient's head position, so that the most accurate reflection of the light hits exactly where it's being examined;
3. Look up the binocular to establish the site;

4. Maintain a comfortable posture, do not twist the neck, bending waist, turn around to accommodate Light source and reflected light.

1.1.2 Other Commonly Used Examination Equipments

In clinical diagnosis and treatment, the commonly used examination equipments are: otoscope, tuning fork, the anterior rhinoscope, the posterior rhinoscope, the indirect laryngoscope, the gun-shaped forceps, the geniculate forceps, the cerumen hook, the spatula (the tongue depressor), the spray bottle or watering can, endoscopic (indirect nasopharyngoscopy), knee tweezers, cotton swabs, alcohol lamps, dirt basins, etc. (Fig. 1.3).

In recent years, lights and mirrors have been gradually replaced by headlights with better illumination and clearer

Fig. 1.3 Otorhinolaryngology Head and Neck Surgery commonly used examination equipment: (1) Pneumatic otoscope, (2) Geniculate forceps, (3) Gun-shaped forceps, (4) Otoscope, (5) Electric otoscope, (6) Posterior rhinoscope, (7) Sprayer, (8) Indirect pharyngoscope, (9) Tuning fork, (10) Corner spatula, (11) Cerumen hook, (12) Anterior rhinoscope, (13) Cotton applicator

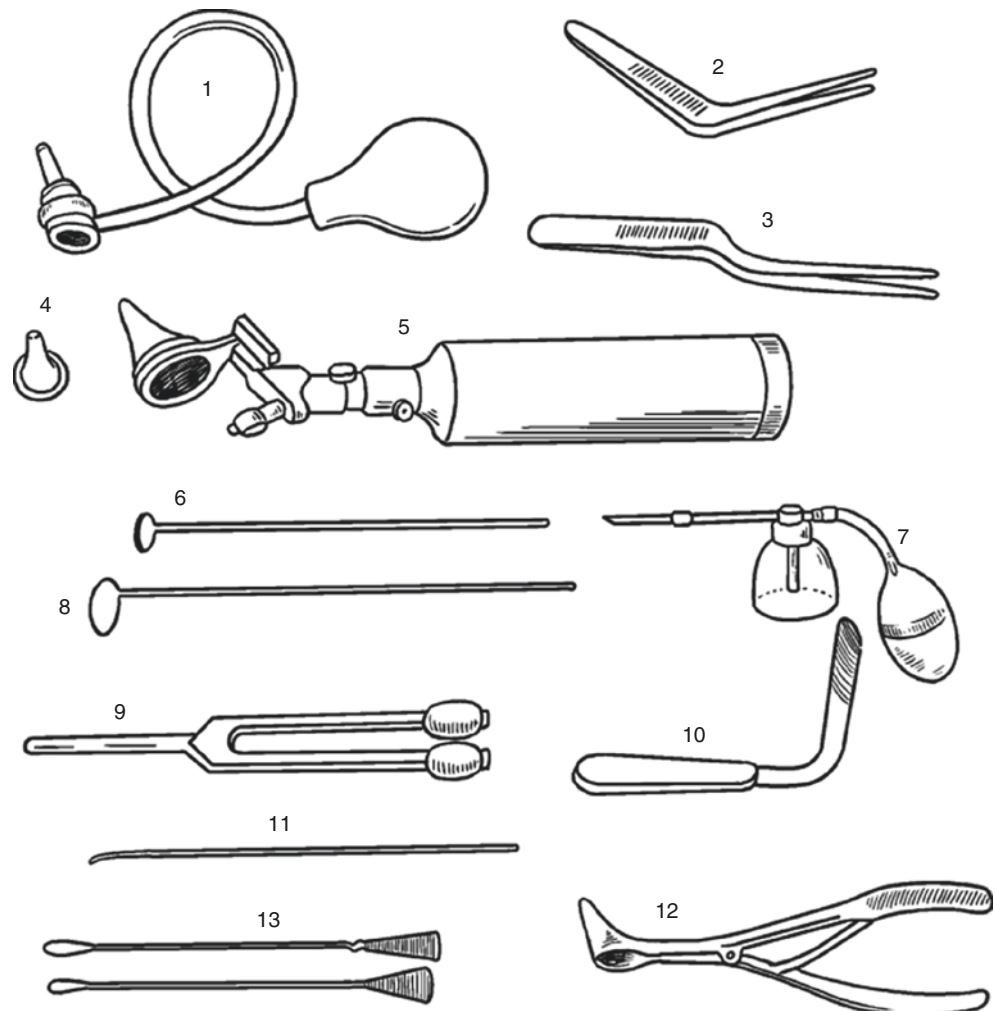




Fig. 1.4 Frame LED magnifier

vision, such as cold light source lamp, LED headlight, LED magnifier (Fig. 1.4), electric otoscope, Electrosurgical stents and equipments with better lighting and higher definition.

1.2 ENT Comprehensive Diagnosis and Treatment Unit

Otorhinolaryngology Comprehensive treatment for examination and treatment designed with inspection chair, cold light source, set the spray, attractor, inflator, spotlight, self-induction heater, automatic sewage in one box, and some also optional reading light boxes, monitors, microscopes and image acquisition, endoscopic standard interface and other equipment, not only to the doctor's examination has brought great convenience, but also for routine treatment.

1.2.1 Basic Structure and Main Functions

The platform consists of the workbench, the electric inspection chair or the therapy chair. The introductions are as follow:

Workbench

Includes control panel, spotlight, spray gun, suction gun, cold light source, self-induction warmer, etc., and also can be equipped with reading lamp, monitor, etc. (Fig. 1.5). The main function:

1. Spray

Can atomize the liquid medicine into tiny droplets and spray it on the body cavity or body surface. The advantage of the spray gun is that the atomized particles are small, evenly distributed, irritant and easy to operate.

2. Extract

To attract negative pressure adjustable straw, used for ear, nose, pharynx, laryngeal secretions, pus extract.

3. Insufflation

For the throat tube blowing and constant jet device to provide positive pressure air supply for the throat and external auditory canal purulent blood, secretions, foreign body cleaning and maxillary sinus rinse. It is characterized by adjustable pressure, flow changes with the pressure of the inflatable to meet the requirements.

4. Spotlight

Overcome the short range of activities of vertical lighting, fever, light is not concentrated, scattered light interference, lack of brightness and can not be adjusted and other shortcomings, which is characterized by concentration, brightness adjustable, non-thermal radiation, light arm Large range of activities.

5. Self-Induction Heating

For indirect laryngoscope warming pre-heating, when the mirror gets into the contact induction heating zone, the heater will automatically blow hot air, its advantage is easy to use, no fire hazards, and appropriate temperature.

6. Cold Light Source

It provides light source to the endoscope, and its brightness is adjustable,

7. Automatic Sewage

Automatic sewage will attract the process of storage in the dirt bottle automatically discharge dirt, automatic cleaning, which is characterized by automatic monitoring, automatic discharge, eliminating the need for manual cleaning liquid bottles caused by direct contact with infection.

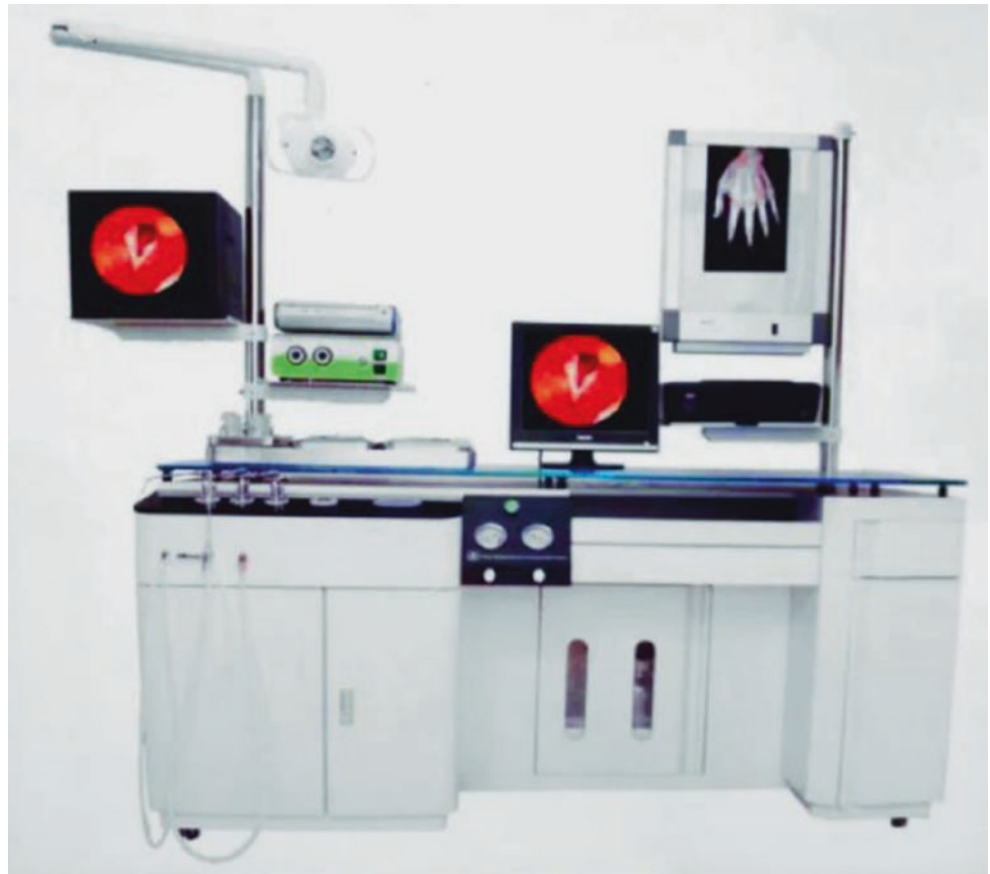
8. Reading

Can read X-ray, CT, MRI and other video film.

The workbench is also equipped with a conventional equipment article category placement area:

1. Instrument plate: placing cleaning equipment (tongue depressor, the anterior rhinoscope, the posterior rhinoscope, etc.);
2. Insertion tube: indirect laryngoscope, hooks, Tweezers, etc.;
3. Tank: placing cotton balls, gauze, Vaseline gauze, etc.;
4. Pollution equipment collection device: the used equipment will be placed in the classification within the collection box within the workbench;
5. Placement Area of drugs: 3% hydrogen peroxide solution, 1% ephedrine solution, 1–2% tetracaine solution.

Fig. 1.5 Otolaryngology
Head and Neck Surgery
General Hospital equipment



The Electric Chair

For the work of the main supporting facilities, which can be divided into two types: lifted and rotated inspection chair and therapy chair.

1.2.2 Classification

According to the station is divided into a single station and double station type. The single station workbench is only for one physician use. The double station workbench is designed for two physicians to work at both sides of the platform, also for the clinical teaching.

According to the style can be divided into writing desktop and screen style, the former is a combination of clinic and writing desk, set inspection, treatment, medical record writing and other work in one, for a relatively narrow place, such as a small room interval examination room or Treatment room; the latter is the combination of clinic and screen, can take full advantage of the limited space for clinicians to create a relatively independent working environment, suitable for more spacious places.

1.3 Endoscopy

The anatomic sites of the organs at the otolaryngology head and neck are concealed, so the traditional inspection cannot expose them. But the medical endoscope is a medical electrical device to provide the internal observation or imaging for the diagnosis and the treatment by inserting into the body. It constitutes cold light source, the objective lens, the image acquisition system and the eyepiece. It is divided into the rigid endoscopy and the flexible endoscopy.

1.3.1 Rigid Endoscope

Common endoscopes used in the otolaryngology head and neck surgery department include the rhinoendoscope, the optic endoscope, the esophagoscope and the bronchoscope. The angles of the rhinoendoscope view camera maybe at 0, 30, 70, 90, 120° and other degree angle and the scopic diameter may be 2.7–4.0 mm (Fig. 1.6). In recent years, there appears a variable perspective endoscope, which is more convenient to use. The rhinoendoscope is used to synchro-

Fig. 1.6 Endorhinoscopic instruments

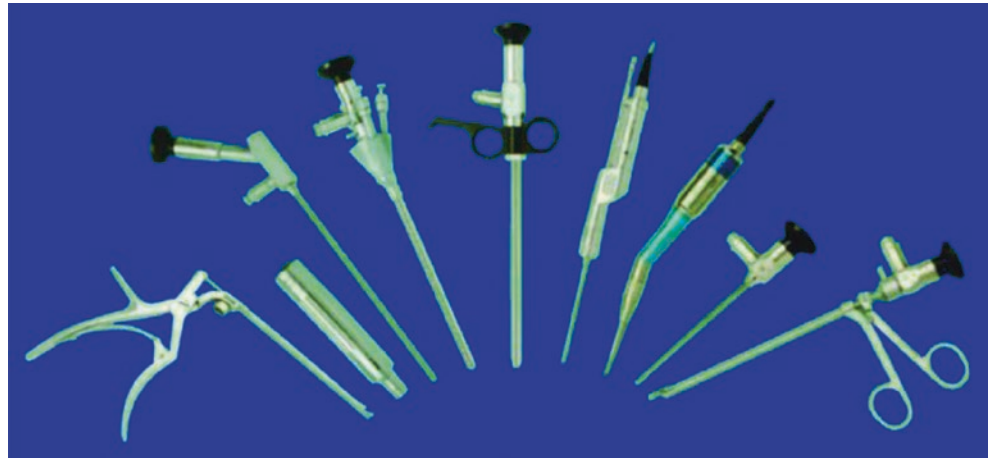


Fig. 1.7 Endorhinoscopic rhinopolyp

nously observe the nose and the rhinal pharynx (Fig. 1.7) even the internal structure of the paranasal sinuses through the display monitor to make the vision clearer. The nasal and the Para nasal sinus disease' precision and accurate therapy could be made by the supporting surgical instruments.

Compared to the endoscopic size, the otoscopic diameter is smaller. It is mainly used to inspect the external auditory canal and the tympanic membrane. The tympanum could be observed through the tympanic membrane, which has great diagnostic value on the external and the middle ear diseases (Fig. 1.8). The otic operative vision is clear during operation (Fig. 1.9), so it is possible to observe the lesions hard to be perceived by the naked eyes, the residual cholesteatoma



Fig. 1.8 Otoendoscopic comprehensive imaging system

existing and so on, and it makes the middle ear surgery more precise, minimally invasive and safer. But both hands of the operators are inconvenient.

1.3.2 Soft Endoscope

Soft endoscope include fiber endoscope, electronic endoscope, etc. The fiber endoscope mainly includes the fiber



Fig. 1.9 Clear endoscopic imaging of the tympanic membrane

rhinolaryngopharyngoscope, the Eustachian tube, and sometimes the fiber gastroscopy and the fiber bronchoscopy also can be applied. The fiber rhinolaryngopharyngoscope consists of three main parts, the cold light source, the endoscope and the imaging system (Fig. 1.10). Compared to the fiber endoscope, the electric endoscope replaces the fiber bundle with the electric micro image sensor, which is thinner and also displaying the imaging clearer (Fig. 1.11). Most of the widely used electric endoscopes at present are matched with the therapy pipes, which introduce the biopsy forceps and the laser fibers to facilitate the examination and therapy.

1.3.3 Narrow-Band Imaging

Narrow-banding imaging (NBI), being used in recent years, during which the light through special filters becomes 420 nm and 520 nm narrow-waves, and their composite wavelength corresponds to the spectrum of the hemoglobin absorption. The 420 nm length wave is easy to be absorbed by the mucosal fibrous tissues; and the 520 nm length wave effect on the sub-mucosa vessels, distinguishing the mucosal layer's lesions after digital processing and which also highlight the mucosa-vascular distribution, contributing to detect the micro lesions early.



Fig. 1.10 Fiber rhinolaryngopharyngoscope



Fig. 1.11 Electric rhinolaryngopharyngeal vocal cord inspection imaging

1.4 Other Special Examination Equipment

Otorhinolaryngology Head and Neck Surgery involves otorhinolaryngology, audiology, vestibular science, voice and other multi-branch disciplines, for more specialist examination equipment, see the relevant sections. This section will introduce the most commonly used pure-sound audiometer and the recent 3D-operation microscope and 3D-display system.

The pure-tone audiometer is equipment sending the pure tones, which are at different frequency and intensity and these are produced from the electronic oscillating and amplification circuit based on the electroacoustic principles, to the clients through headphones to respectively test each-frequency threshold-intensity (Fig. 1.12). Acoustic intensity would be indicated with 'dB'.

The recording curve of each frequency (hearing curve) is called the audiogram, and it could provide an accordance to the qualitative, quantitative and positional diagnosis.

Some hallmark of pure-tone acoustic curves have special significance on determining the causes of deafness (Fig. 1.13), such as at the bone-conduction audio threshold curve, the corresponding intensity at the 1000-Hz site is higher than that at the 4000-Hz site and at the 2000-Hz site has a sudden dropping, but both threshold extremities are at a normal range, which is a typical otosclerosis hearing curve; if the hearing loss is not severe but the corresponding intensity at the 4000-Hz and at the 3000-Hz hearings have evident loss, it is noise-induced-deafness's hearing curve.

Surgical microscope is the key and important equipment for ear microsurgery and otorhinolaryngology. In each of the two optical paths of some imported surgical microscopes, a

Fig. 1.12 Pure sound audiometer



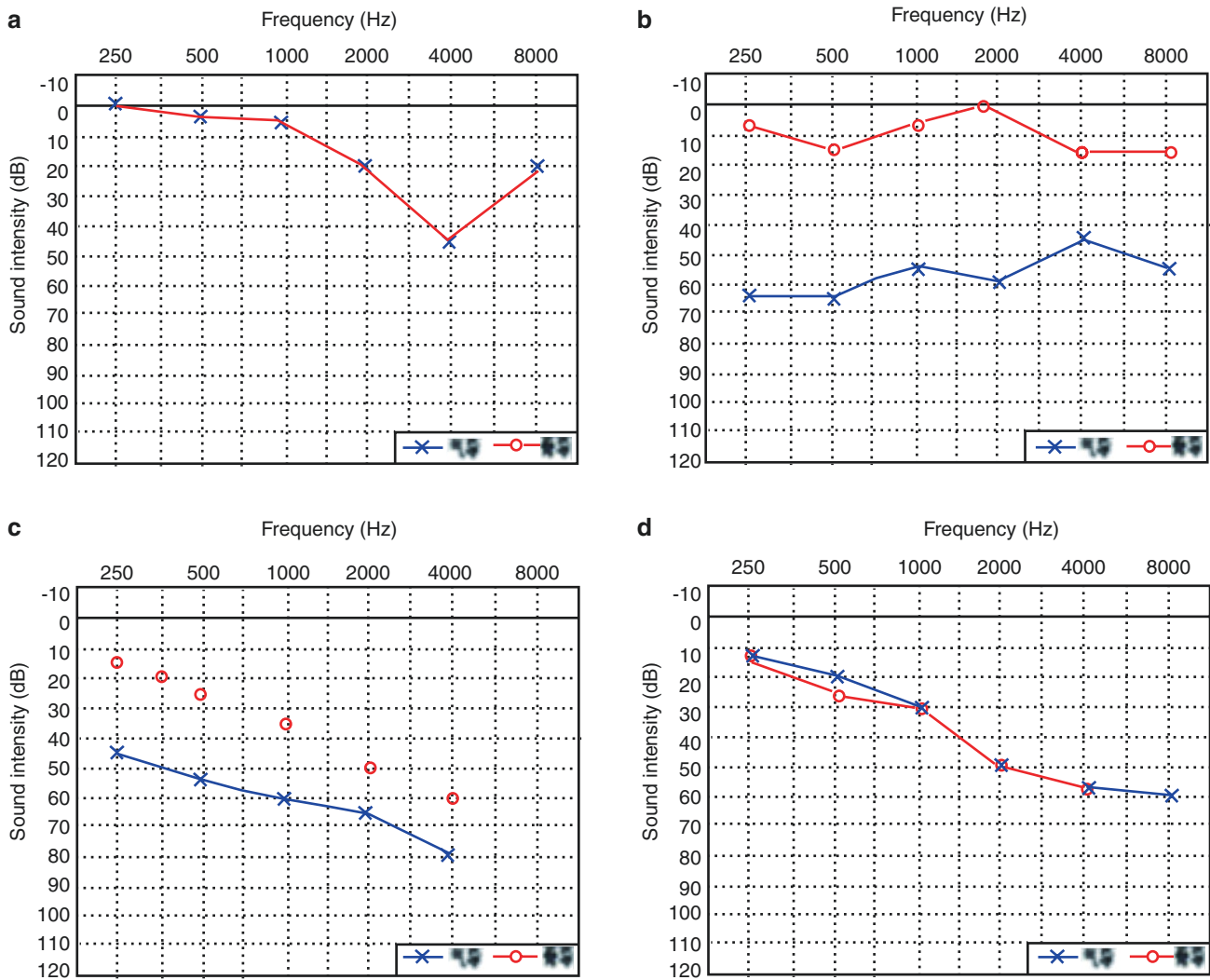


Fig. 1.13 Four typical pure-tone hearing curves. (a) Noise-induced deafness, (b) conductive deafness, (c) mixed deafness, (d) sensorial deafness

camera is installed, and the obtained images are processed to be displayed on the 3D display screen, observers wear 3D glasses to watch stereoscopic images on the screen, video teaching and surgery live. China has developed a surgical microscope stereoscopic video demonstration device, by the

3D high-definition digital video camera, 3D high-definition LCD monitor and adjust the bracket, which has a 3D high-definition digital camera original lens modified and coupled with a micro-camera lens and focus light source Microphone Adapter (Fig. 1.14).

Fig. 1.14 3D operative microscope and display system

