

SURGERY ON THE NASAL STRUCTURES AND SINUSES UNDER CONTINUOUS SCREENING WITH X-RAYS

H. Lenz, Berlin, W.-Germany and G. A. Sedee, Utrecht, the Netherlands

Surgery on the bony and cartilaginous structures of the nose and sinuses is often done under poor direct vision or blindly. Palpation during the intervention is often the only guiding information and this presumes a great anatomopathological knowledge, imagination and operative experience on the part of the surgeon.

To the specialising student or young surgeon it is of prime importance to be able to follow and understand at all times the steps of the intervention even in those parts where direct sight is not possible. To this end the X-ray apparatus with an image intensifier and television transducer which will be described later can be succesfully applied. It has been proved possible to orientate oneself and a larger group of spectators on the screen in areas ordinarily difficult to be seen by the surgeon and not at all by onlookers.

Apparatus

The screening X-ray apparatus is one of a type that allows such movements

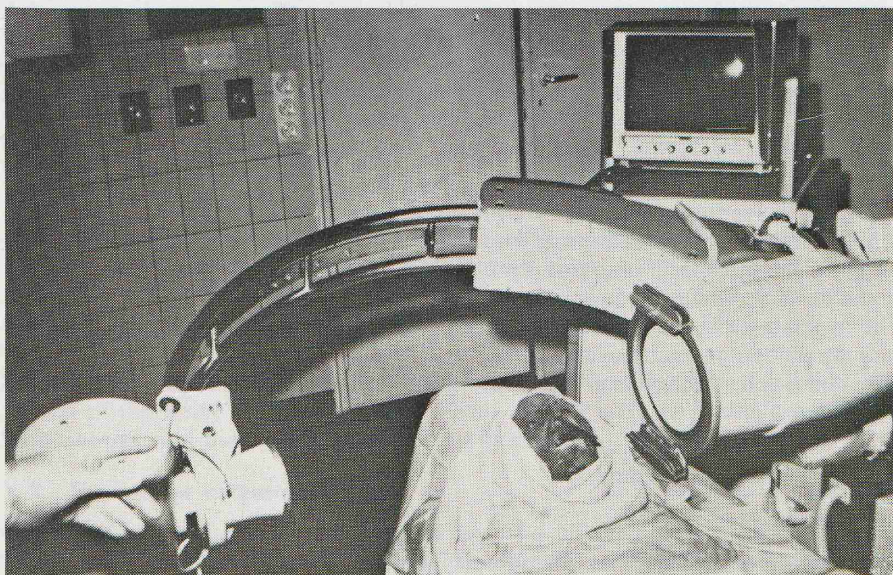


Figure 1. Positioning of the siremobil and television circuit. This is the same during operation.

that the head can be observed in three planes perpendicular one to another and not hamper the surgeon while operating.

We have made use of a Siremobil, which has an X-ray tube and image intensifier mounted on a semi-circular arm, which can slide and rotate. The patient is lying with his head slightly elevated. The centre beam passes through nose and face (Figure 1). A footswitch is operated by the surgeon or better by his assistant.

The bodies are protected with lead aprons, while the hands are covered with normal gloves. An irradiation film badge is worn near the hand as a check while screening, the hands are withdrawn from the primary beam.

With the aid of a television circuit the amplified signals from the image intensifier are transmitted to a monitor.

Independently of the position of the patient the position of the X-ray tube and the direction of the beam can be altered by radiological attendants. The operating table of course must be adapted and be radiotranslucent.

Screening with different paralaxes and frequent viewing will build up a stereoscopic impression in the mind of the surgeon.

Varying the kilo-voltage in the X-ray tube allows the observer to recognise the different absorptions in the tissues of the skin and subcutaneous layers, cartilage and bone. Important single images or operation procedures can be filed on the tape of a videorecorder, for immediate review or later for teaching purposes.

Concerning the irradiation dose the following facts can be mentioned:

The maximal dose on the hand, arm or head allowed in the Netherland is: 15 rem quarterly

The dose of an exposure depends on the kilo-voltage of the X-ray tube, the filters used, the number of the milli-ampères used in the apparatus, the distance from the focus in the X-ray tube, the time of exposure, the exposed surface.

The set-up at the operating table is:

The surgeon standing beside the X-ray tube well enveloped in lead, the assistant and nurse standing opposite the surgeon can move away behind a leadglass screen, where the footswitch is used, the number of kilo-voltage is regulated on 40—45, the number of milli-ampères is 2 to 3, the total exposure time is 10 to 15 minutes.

The irradiation the surgeon gets is less than the dose a röntgen diagnost receives when doing a routine abdominal examination.

The film badge, the surgeon must wear, serves as a check on the permissible irradiation.

Application of the method:

1. Osteotomies:

On the monitor the outlines of the cartilaginous and bony nose are visible as well as the overlying soft tissues.

Under continuous X-ray control the chisel is introduced in the nose in such

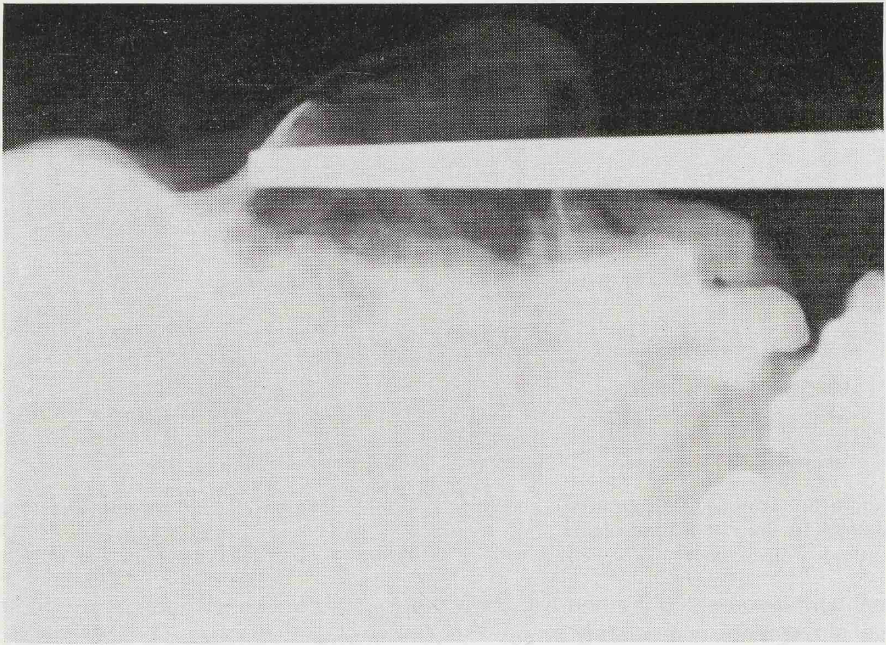


Figure 2. Medial osteotomy. X-ray control of the proper length of the cut up to the frontal nasal spine.

a way that position, contact and movement of the instrument can be observed, also the component parts of the bony pyramid and their relation to neighbouring structures. In such a way not only the beginning and the result of an osteotomy can be visibly demonstrated but also and more important, the execution of the entire chiseling procedure.

1. 1. The medial osteotomy:

In the nose differentiated according to tissue density the chisel can be directed to or from special structures. One of these structures in the phase of doing the medial osteotomies is the K-area, the junction area of cartilaginous septum, nasal bones and upper lateral cartilages. The positioning of the chisel just cranially of the K-area and its relation to the skin is visible. The extent of the medial osteotomies into the nasal-frontal spine is readily demonstrable on the monitor for students and teachers (Figure 2). The comparison between the widths of the spine and the chisel is easily visible with the transversal X-ray tube. Intrusion in the frontal sinus can be prevented.

1. 2. The lateral osteotomy

During the lateral osteotomy the saw and the chisel are being manipulated under visual control so that proper positioning is secured in relation to the lacrimal duct, to the lamina papyracea and to the ethmoid cells. In case the chisel arrives in an area of callus or bone resorption the above

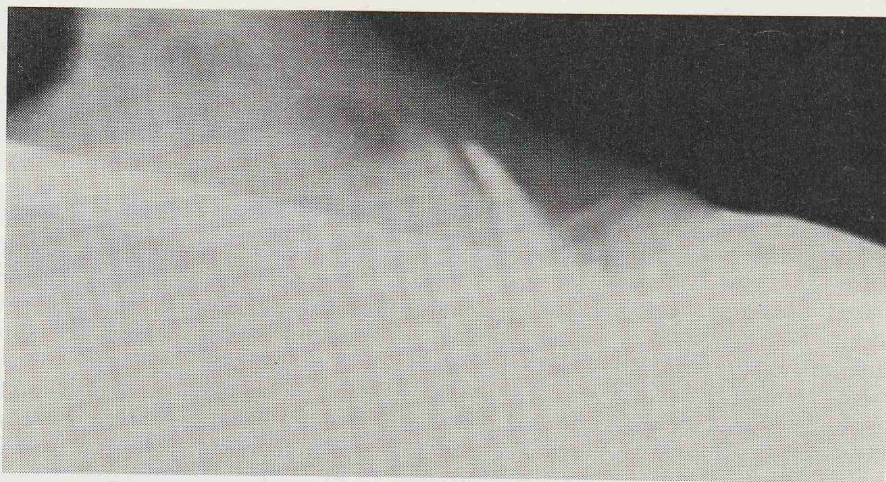


Figure 3. Transverse osteotomy showing the right position of the curved chisel in relation to the nasofrontal spine.

mentioned screening method will show the fracturing. The surgeon can correct his movements immediately.

1. 3. The transverse osteotomy

The curved chisel is placed on the right spot in relation to the nasofrontal spine and its origin in the frontal bone (Figure 3).

In such a way the spina nasofrontalis can be separated from the frontal bone without leaving the ill-famed step.

2. Push down

The position of all mobilised segments of bone and cartilage before, during and after the push down manoeuvre is better under control on the monitor. Imbrications are prepared or prevented. Steps and spikes of bone visible in the monitor can be removed.

3. Ethmoidectomy

The maxillo-facial parts of the human skull are a complicated structure. These become translucent with X-ray's. The ethmoid cells are clearly outlined in the projection of Rhese. With little movements the outer and inner walls will show up differentiated. The most posteriorly situated ethmoid cells will become recognisable.

4. The frontal and maxillary sinusitis

With the X-ray screen T.V. monitor intensifying method the conservative and operative treatment of pathology in the frontal and maxillary sinus can be demonstrated and followed. Trepanation holes and osteoperiosteal flaps can be defined and fashioned in optimal positions (Figure 4). For the radical frontal

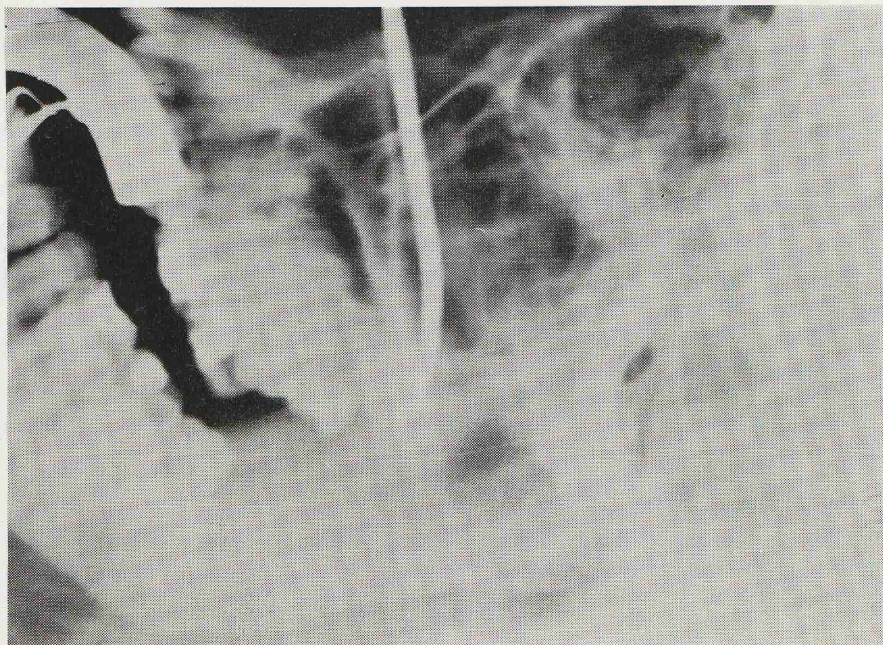


Figure 4. Elevator in inferior tunnel reaching the velum.

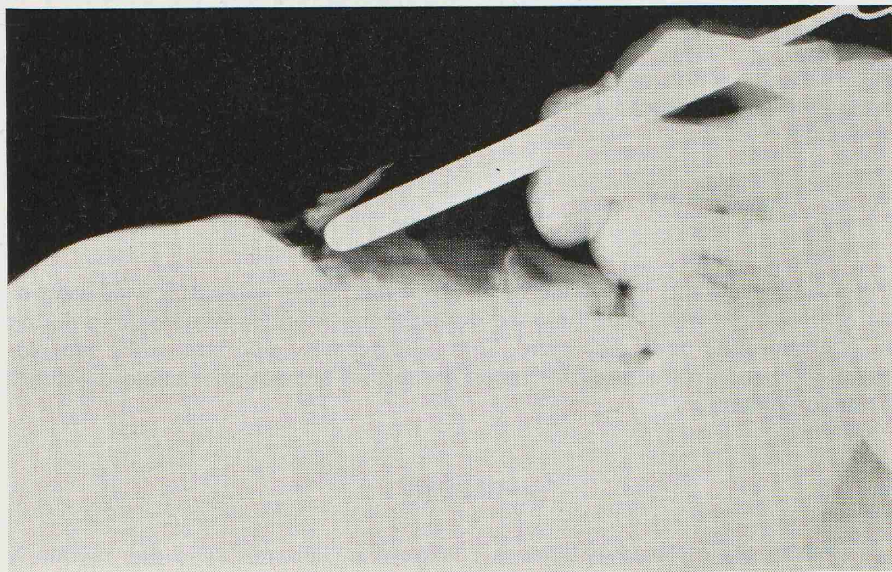


Figure 5.

operation the visualisation of the tabula interna in the side view is important. The position of the canula or scope in an endonasal frontal wash out and diagnostic inspection is highly important. From a sinus, obscured on the X-ray picture and non-purulent during a wash-out, a biopsy can be taken through a trocar placed in a predefined area. In this way a number of diagnostic Caldwell-Luc operations can be saved.

5. Diagnosis and repositioning of fractures

Fractures in the maxillo-facial and basilar area can be followed in their extent better than X-ray pictures taken in two planes. Repositioning is easily brought into view (Figure 5).

The effect of bone fixation and bulbar support can be repeatedly checked.

6. Taking of biopsies

The position of the jaws of a pair of pincers to take a biopsy is judged in relation to the visible extent of a tumor in the depth.

7. Pathology of bone

Osteoma formation or decalcification of bone are visible on the ordinary X-ray picture but the radical extirpation of this pathology can be made visible durante operation.

DISCUSSION

The advantage to be able to visualise the instruments and the results during the intervention in an area that is hardly accessible and the possibility to register the images on films or tapes justifies the application of a small dosis of X-rays.

The dosis for a ten minutes observation is in the same order as an X-ray investigation of the stomach. The surgeon and his staff can stay out of the röntgenrays.

SUMMARY

The possibilities and advantage of a low-power X-ray apparatus with electronic amplification which can be used during longer periods of screening during an operation has been discussed. This is especially important in the maxillo-facial and basilar structures for those areas that are not accessible for direct vision or palpation.

RÉSUMÉ

Les possibilités et les avantages à l'usage d'un appareil avec des rayons X d'une intensité mineure ont été discutées. Les images faites avec ces rayons peuvent être intensifiées électroniquement ainsi que le chirurgien puisse ob-

server fréquemment et longuement le procédé opératoire. Ce fait paraît spécialement important pour le diagnostic et le traitement des structures maxillo-faciales et basilaires. Surtout parce qu'elles sont inaccessibles pour l'observation directe ou la palpation.

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Klinik Steglitz, Freie Universität
Departm. oto-rhino-laryngology.
Berlin, West-Germany.

Departm. oto-rhino-laryngology,
State University, Utrecht,
Utrecht, the Netherlands.