ROENTGEN DIAGNOSIS OF PARANASAL DISEASE USING RETROBULBAR AIR INSUFFLATION

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眼窩内空気注入による副鼻腔疾患のX線診断

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眼窩内酸素注入による眼窩内異物のX線診断は，第二次世界大戦中に試みられた．眼窩内空気注入後X線断層撮影による眼窩内腫瘍診断は，1956年 Bertelsenによつて発展された．著者は，より簡便なる眼窩内空気注入法を用い，眼窩疾患のX線診断のみならず，眼窩周辺の副鼻腔疾患の診断に応用した．

空気約 8.0ccを眼球後部軟部組織に注入後X線断層撮影により眼球ならびに視神経は注入した空気により明瞭に区劃され同時に眼窩内病変が追求される．のみならず眼窩周辺部副鼻腔疾患のX線診断にきわめて有効である．とくに，副鼻腔腫瘍が眼窩内へ浸入した場合は，X線単純撮影によつては不明瞭なる時でも，眼窩内空気注入後X線断層撮影法により比較的正確なる診断が可能である．副鼻腔腫瘍の眼窩への浸潤在否は，眼球摘出如何を決める鍵である．上顎洞後壁の腫瘍浸潤による破壊が確実なる場合は，手術適合症ではない．上顎癌の楔状洞浸入，篩骨蜂窩癌の眼窩内浸潤，前頭洞粘液蓄積症ならびに骨腫の眼窩内への浸入ならびに視神経との形態的関係等もこの方法により明らかにする事が可能である．眼窩内空気注入後X線断層検査は，眼窩内疾患はもちろん，副鼻腔疾患，とくに腫瘍の手術前検査法として必要かつ重要なる方法である．

後記，本論文の発表にあたり，懇切なる御指導ならびに助言を賜わりました京都大学福田正教授の御厚情に深く感謝申上げます．

Orbital air of oxygen injection was used during World War II by Drs. Schlie and Hodes[1] for roentgen diagnosis of foreign body localization. Dr. Bertelsen used retrobulber air insufflation for roentgen diagnosis of orbital tumor. Tomographic examination was performed after retrobular air insufflation by Dr. Bertelsen[2]. The author used a simplified modification[3] of Dr. Bertelsen's method in orbital disease as well as in paranasal disease.

Method and Technic

Without anesthesia a 5 cm long 20 gauge needle is inserted into the orbit through the lateral portion of the lower or upper eyelid skin, avoiding the eyeball. When the needle meets the inferior posterior or superior posterior orbita wall the needle is

pulled backward about 1 cm, redirected 30° upwards and inserted about 1-2 mm further. A slight resistance is felt as it puncture the fascia of the rectus muscle. 5 to 8 cc of air are then injected very slowly, filling the retrobulbar soft tissue which is well surround by occular muscles and it is mostly consisted of fat tissue and optic nerve. The injected air is spreading homogenousely retrobulbar space and leaked to the subconjunctival space the air insufflation is counted to be successful. Posterior and anterior tomograms of the orbita including maxillary sinuses are made 0.5 cm to 5 cm with 5 mm between each centimeter cut. Straight lateral tomograms including maxillary sinus are also made 1 cm to 7 cm with 5 mm between each centimeter cut. After the examination aspiration of 2-3 cc of air through subconjunctival puncture is usually possible and the aspiration reduceds patient's discomfortness. The remained air is absorbed completely within 48 hours but mostly within 24 hours. Not a single serious complications such as air embolism were met after 150 examinations. During and after air insufflation the patient feels heaviness and discomfortness in the eye, but it disappears within 12 hours. This method can be done in out patient base.

Indications :

Tomographic examination after retrobulbar air insufflation is a very important diagnostic method of orbital tumor (Fig. 1) (Fig. 2) and optic nerve pathology (Fig. 3) (Fig. 4) (Fig. 5). The author has used it to show orbital involvement in advanced disease of the paranasal sinuses, information of great therapeutic importance.

Results

The method outlines with air the orbital and periorbital bony structures, the orbital soft tissue, and in particular the eyeball and optic nerve. Displacement of the eyeball and optic nerve are clearly demonstrated (Fig. 3). By tomographic examination of orbita including nose and paranasal sinuses the bony walls of the paranasal sinuses are nicely visible. When the maxillary cancer (Fig. 6) or ethmoid cancer (Fig. 7) involves the orbit bony destruction and displacement of the eyeball are demonstrated, while in conventional films it is very difficult to judge. In case of orbital involvement of maxillary or ethmoid cancer the eyeball should be enucleated even unimpairment of the vision. By this method the posterior wall destruction of maxillary sinus in maxillary cancer is clearly demonstrated in the lateral tomographic examination, while it is very diffcult to determine in conventional film (Fig. 8) (Fig. 9). If the posterior wall is involved by tumor destruction the case could not be operated. In 5-7 cm cut lateral tomographic films the sphenoid sinus and sella turcica are clearly seen and if the tumor is invaded sphenoid sinus (Fig. 10) the case should not be operated.

By using this method, in cases of frontal sinus mucocele (Fig. 11) or osteoma the relationship between orbita and diseased frontal sinus is well demonstrable, and gives good preoperative evaluation.

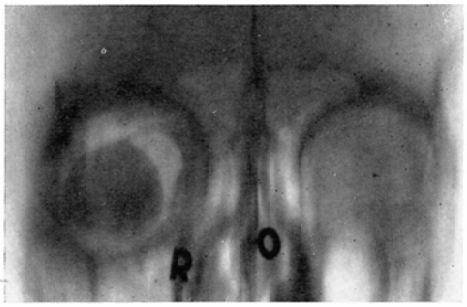
Summary and Conclusion :

Tomographic examination of orbita after retrophulbar air insufflation is very important diagnostic method in orbital disease, and also this method is very useful preoperativ procedure in advanced peranasal disease specially in maxillary and ethmoid cancer.

The author's simplified method can be used in out petient base without any serious complications.

References

1) Schlie, H. and P.J. Hodes: Injection of Oxygen into Tenon's Capsule. Arch. Ophth. 35 : 13—14, 1946. —2) Bertelsen T.I.: A New and Improved Technique in Orbital Pneumography. Acta Ophth. Vol. 38 p. 57—61, Jan. 1960. —3) Kang, S.R., Koo. B.S.: An Improved, Simplified Pneumo-orbitography. The Korean Choong Ang Medical Journal, Vol. 1, No. 8. Nov. 1961.



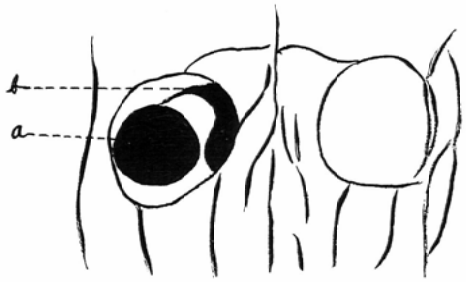


Fig. 1 (a): 16 years old male patient who has 3 years history of the right side esophthalmus and gradual loss of vision. A.P.A. tomogram after 8cc of retrobulbar air insufflation.
a) Good outlineing of the right eyeball which is a little dislocated laterally and downwards.
b) Oblique muscle.

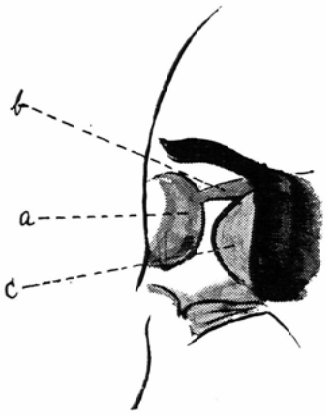


Fig. 1 (b): Same patient's lateral tomogram of 2 cm cut.
a) Eyeball
b) Optic nerve which is a little pushed upwards.
c) A rounded tumor mass which is attached to the posterior wall of the orbit. By surgery it is proved to be a large neurinoma.

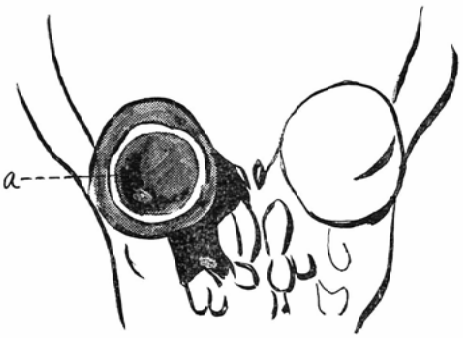


Fig. 2 (a): A PA tomogram after retrobulber air insufflation in a case retinoblastoma.
a) Good outlineing of the eyeball with air. . No pathology.

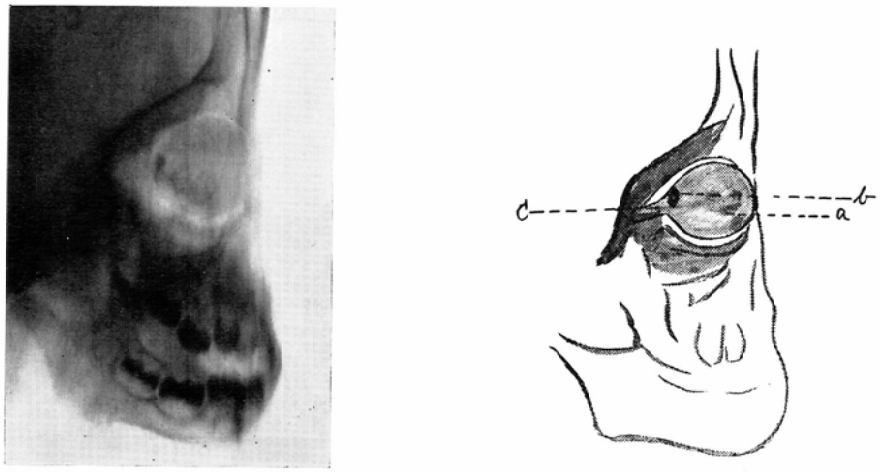


Fig. 2 (b): A lateral tomogram of the same patieht.
a) Eyeball b) optic nerve
c) Calcification of the retina.

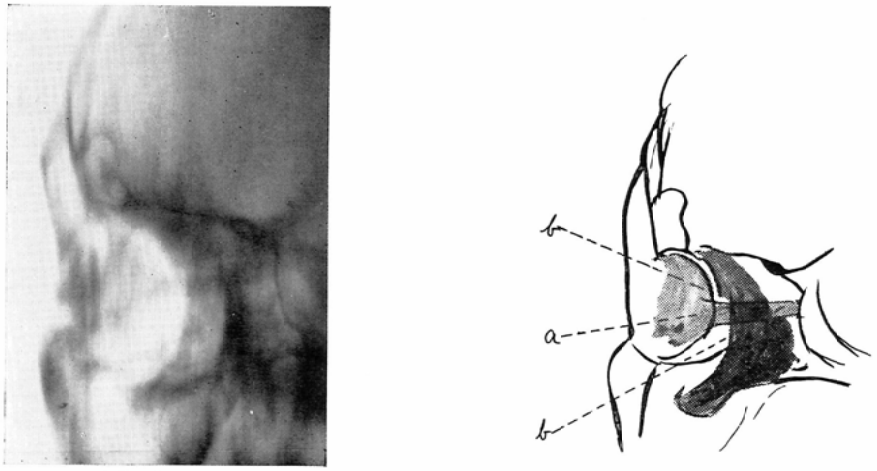


Fig. 3: Normal size of an optic nerve after retrobulbar air insufflation.
a) Eyeball b) Normal size of an optic nerve

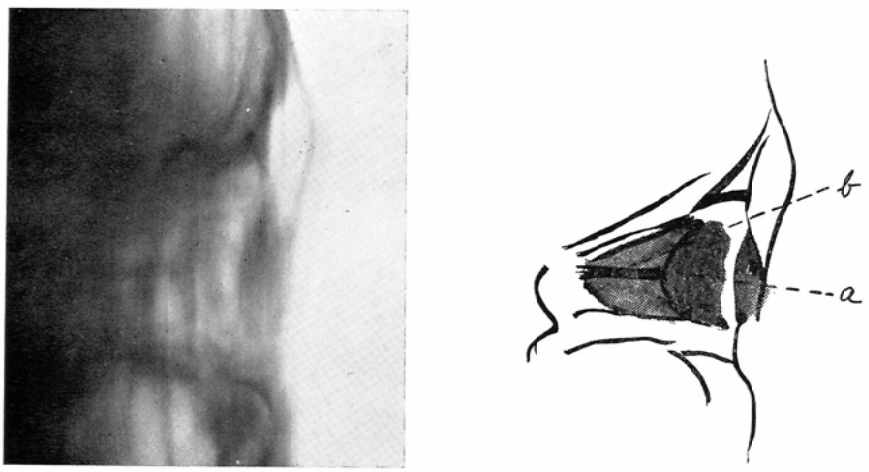


Fig. 4: A lateral tomogram in a case of optic nerve atrophy
a) Eyeball b) Very small atrophic optic nerve

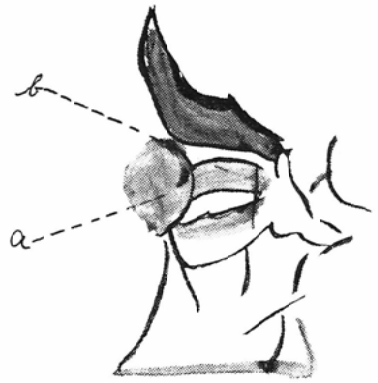
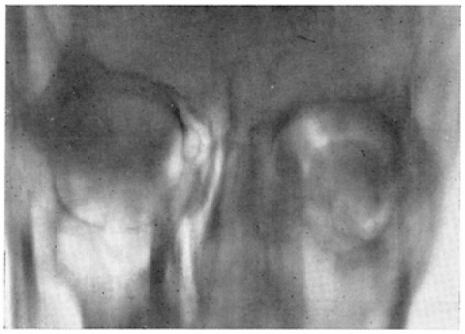


Fig. 5: A lateral tomogram in a case of optic neuritis afer retrobulbar air insufflation.
a) Eyeball a) Swollen optic nerve which is two times bigger than the normal one.



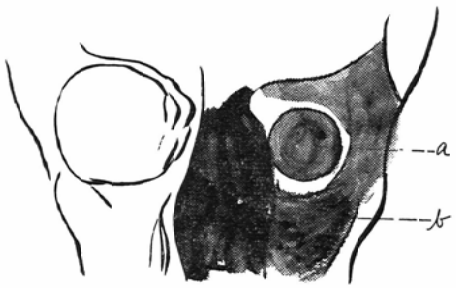


Fig. 6: A P. A. tomogram in a case of maxillary cancer after retrobulbar air insufflation.
a) Lateral displacement of the eyeball due tumor involvement in the orbita.
b) Extensive tumor in the left maxillary sinus destroying the inferior wall of the orbita and involvement of the left ethmoid sinus and left nasal cavity. The tumor is also invading the medial part of the orbital cavity.

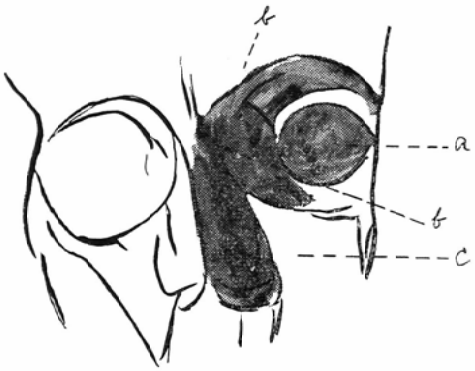
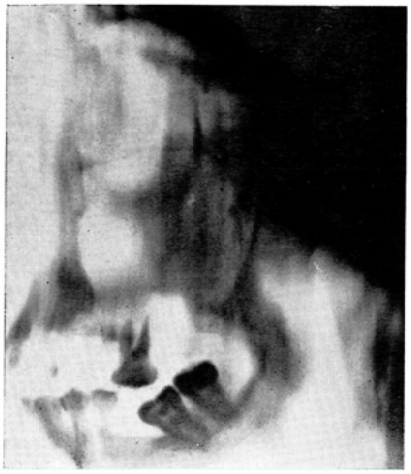


Fig. 7: A P.A. tomogram in a case of ethmoid cancer after retrobulbar air insufflation.
a) Lateral displacement of the eyeball due to tumor invesion of the orbita from ethmoid sinus.
b) Extensive tumor in the left ethmoid sinus extending to the medial orbital cavity. And also this tumor is invading the entire left nasal cavity.
c) No tumor involvement of the left maxillary sinus.



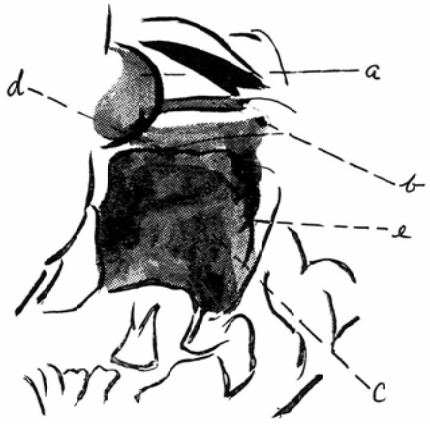


Fig. 8: A latral tomogram of extensive maxillary cancer after retrobulbar air insufflation.
a) Normal eyeball b) Normal optic nerve.
c) Tumor filling of the maxillary sinus and complete destruction of the inferior wall of the maxillary sinus and a tooth is hanging on the tumor.
d) Tumor destruction of the superior wall of the maxillary sinus and remaining paper thin wall.
e) Tumor destruction of the posterior wall of the maxillary sinus, and processus pterygoideus is seen behind the destroyed posterior wall without destruction

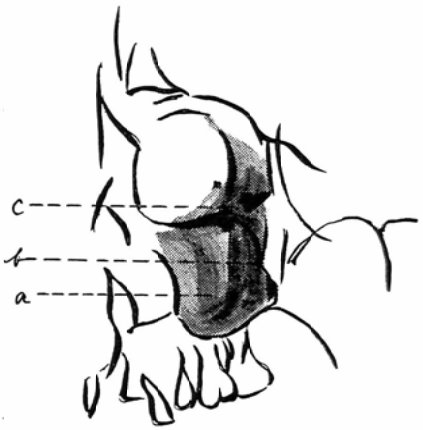


Fig. 9: A lateral tomogram of a maxillary cancer case after retrobulbar air insufflation.
a) Tumor filling of the maxillary sinus.
b) Tumor destruction of the posterior wall of the maxillary sinus.
c) Tumor destruction of the posterior most part of the inferior wall of the orbita.

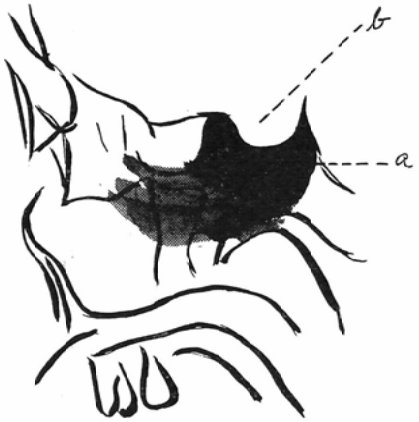
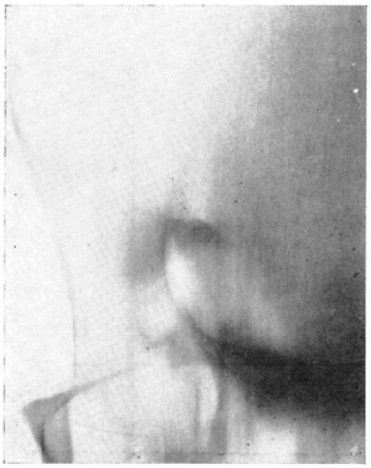


Fig. 10: 7 cm cut lateral tomogram of a case of maxillary cancer after retrobulbar air insufflation.
a) Extensive tumor involvement of sphenoid sinus.
b) Sella turcica which is not destroyed by the tumor.



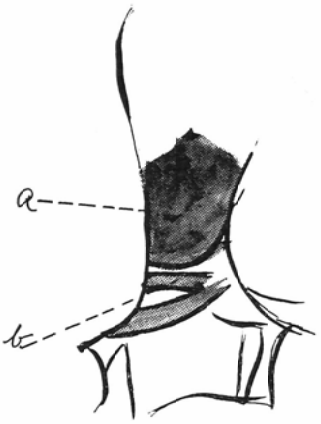


Fig. 11: A lateral tomogram of a case of frontal sinus mucocele after retrobulber air insufflation.
a) Large frontal mucocele invading the orbita. after destroying the superior wall of the orbita.
b) Optic nerve which is a little compressed downwards by the frontal mucocele.