A METHOD OF STUDY OF INTRACRANIAL HÆMORRHAGE IN THE NEW-BORN INFANT

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Within recent years increasing attention has been paid to intracranial hæmorrhage in the newly-born, not only in those infants who survive, but also in the demonstration of the hæmorrhage at necropsy. The difficulty in removing the cranial vault in an infant and the extreme softness of the brain substance render any attempts to determine the position and amount of the injury by ordinary post-mortem methods almost impossible. Acting, therefore, upon the suggestions of Schoenholz³ and of Roberts² the procedure described here was adopted to obviate these difficulties and thus to determine by radiograms the presence, site and size of intracranial hæmorrhage.

Schoenholz, by injecting solutions of red lead into the cerebral vessels, was able to show by means of X-rays the gross changes within the cranium as a result of extravasation from the damaged vessels. Roberts used metallic mercury and, in some cases, iodized oil. Benefiting by the experience of Campbell¹ we used Röntyum (Kahlbaum) and obtained stereoscopic radiograms to assist in the study of the condition. By the use of Röntyum the difficulties of the previous workers have been reduced, as excellent definition is obtained and the finest possible detail of the circulation is obtained since the emulsion does not gravitate.

The apparatus is easily devised as will be seen from Fig. 1. It consists of a metal container (b) with an inlet tube at the upper end and an outlet at the lower. A screw stopper is advisable. The emulsion is prepared by mixing 40 gm. of Röntyum with about 75 c.cm. of distilled water in a mortar. Thorough emulsification is essential and about twenty minutes is required in its preparation to obtain a satisfactory suspension. The container is filled with the Röntyum emulsion and the inlet tube is connected with the bulb, an aneroid manometer (c) intervening so that the pressure within the system may be controlled. The outlet tube is connected with a serum needle (a), the bevelled point of which has been removed. A clip on the outlet tube is useful as an additional control. All connections should be carefully reinforced with fine wire.

1. The carotid artery is the usual site of injection and it is easily found just above the inner end of the clavicle. A ligature is passed under the vessel and a small longitudinal incision is made in the wall. All air is driven out of the system by gentle pressure of the bulb until the Röntyum appears at the needle which is then inserted into the vessel and tied in position. The umbilical vessels may be used, thus obviating the necessity for dissection, but injection

by this route must be made within a few hours of birth, and on account of the changes which occur in the cord after birth is quite unsuitable in those cases in which the infant has survived for more than twelve hours. In still-born infants, however, this route is quite satisfactory and more convenient. When the needle is fixed in the vessel the pressure is gently but steadily raised until the manometer records about 230 mm. of mercury, and this pressure is maintained for about twenty minutes, by which time from 50 to 60 c.cm. of the emulsion will have been injected. The radial artery may be exposed and incised to indicate when the arterial system has been filled and also to act as a safety valve. We have not noted rupture of vessels when the suggested pressure has been maintained and our experience would indicate that much higher pressures fail to cause damage to the vessels. Higher pressures are, however, unnecessary as the finest arterioles are filled at a pressure of 230 mm. of mercury.

When the arterial system is filled a stereoscopic radiogram is taken and the exact location of the hæmorrhages is determined by study of the stereo

FIG. 1.

picture. In our experience Röntyum has been very successful as it does not tend to gravitate even after twenty-four hours; it penetrates the finest arterioles and gives excellent definition. Metallic mercury as used by Roberts has the disadvantage that it tends to sink to the lowest level. Röntyum is considerably less expensive than mercury, and recovery on the grounds of economy (as with mercury) is not worth while. Iodized oil eliminates the difficulty of gravitation, but has the disadvantage of lack of definition in the radiogram.

When permission to perform a post-mortem examination is refused the Röntyum may be injected via the umbilical vessels and radiograms obtained without any evidence of interference. When the carotid artery is exposed there is very little mutilation, and parents are spared the heartaches that so often accompany the ordinary post-mortem examination. The information gained by this method as to the site, size and number of the hæmorrhages is even more accurate than that obtained by the most careful post-mortem technique, and the record may be filed for future reference.

It is not our purpose at present to give the results of our study of intracranial hæmorrhage by this method, but we would emphasize that as the Röntyum emulsion circulates exclusively in the arterial system, the extravasation of blood must be from ruptured arterial vessels. We have compared the picture obtained by traumatic post-mortem rupture of a vessel and subsequent injection, and have noted that the shadow of extravasated Röntyum is altogether different from that which occurs when the emulsion passes into a clot of blood. We have also confirmed at necropsy that the limits of the Röntyum are deter-

FIG. 2. Intra-ventricular hæmorrhage in still-born infant.

mined by the size of the original blood extravasation. In addition, the control of the pressure by the manometer and the severed radial artery acting as a safety valve are sufficient guarantees against damage to the vessels by the injection.

Fig. 2 shows the radiogram in a case of intra-ventricular hæmorrhage in a still-born infant. Fig. 3 is an example of a large hæmorrhage in the right temporal region with smaller ones in the region of the tentorium and in the retina.

Summary.

A method of study of the occurrence, site, size and number of hæmorrhages in cases of intracranial hæmorrhage is described.

The advantages of this method are that permission to perform a necropsy is unnecessary as there is practically no mutilation of the body. The technique is simple, the injected Röntyum is inexpensive, gives excellent definition and does not tend to gravitate. Accurate localization by stereoscopic radiogram is possible and a permanent pictorial record can be kept.

FIG. 3. Large hæmorrhage in the right temporal region with smaller ones in the region of the tentorium and in the retina.

REFERENCES.

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