On a basis of bone-marrow cytology, the term "megalo-blastic anaemia of pregnancy and the puerperium" has been proposed for this type of anaemia.

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ASPHYXIA FOLLOWING DENTAL EXTRACTION IN A HAEMOPHILIAC WITH A NOTE ON THE SPREAD OF INFECTION IN LUDWIG'S ANGINA

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The dangers of dental extraction in haemophilia are well recognized, and numerous cases of persistent haemorrhage are on record. The case here described is of interest on account of the anatomical extent of the haemorrhage, the extravasation of blood involving the deep cervical tissues as far down as the larynx, so that tracheotomy was necessary.

Case Report

The patient, a man aged 35, attended the Eastman Dental Clinic on Oct. 14, 1941, complaining of pain for two days localized to the right second lower molar tooth. He did not admit any previous history of bleeding, so that when dental extraction was performed it was not known that he was a haemophiliac.

His history, which was obtained later, showed that he had in fact suffered from recurrent haemorrhages from the age of 19. There was no abnormality of bleeding among his parents and six brothers. When 19 years old he was admitted to St. Bartholomew's Hospital with a large haematoma of the thigh following a trivial injury, and was readmitted a year later for haemorrhage after dental extraction, when bleeding continued for one week and 550 c.cm. of blood was given. On this occasion the blood-coagulation time was 17½ minutes; after the blood transfusion it was 8½ minutes. At the age of 24 he was admitted to Guy's Hospital with a haematoma of the rectus abdominis and haemarthrosis of the left knee. Bleeding-time was normal and coagulation time was 13 minutes on one occasion (12/5/30) and 16 minutes on a second occasion (24/12/30) (control, 6 minutes). He was readmitted to St. Bartholomew's at the age of 31 with a haematoma of the forearm. The bleeding-time was then 2 minutes 10 seconds and coagulation time 3 minutes 30 seconds (27/8/37) (control, 2 minutes 10 seconds); platelets, 244,000.

When seen on Oct. 14, 1941, the patient had a tender loose second, right lower molar, which was removed under gas anaesthesia. There was no undue difficulty or bleeding, and the patient went home. He returned in the afternoon, 5 hours later, bleeding from the tooth socket, which he stated had begun on the way home. The usual methods of control were attempted—plugging with dry gauze, adrenaline gauze, etc.—

without relief. The patient was kept in the casualty ward, but in spite of repeated packing slow bleeding continued. Early the next morning, 18 hours after extraction, examination of the mouth showed that bleeding was proceeding from the gum at the site of extraction just behind the lower right first molar. Blood was welling up slowly from the depths of the socket, and there was no evidence of any tear of the mucosa other than at the actual situation of the extracted second molar. There was some swelling of the floor of the mouth just medial to the molar region, with the appearance of a submucosal haematoma. Two catgut stitches were introduced, closing over the gum, and external bleeding ceased immediately. Bleeding returned after two hours, and a third stitch was put in; no further haemorrhage occurred from this site. At this time, 24 hours after extraction, it was noted that the submucous swelling of the right side of the floor of the mouth had increased considerably, and there was now in addition a haematoma of the right side of the tongue and swelling of the right submaxillary region of the neck. It was believed that, bleeding from the gum having been controlled, tension in the tissues would not have to be very great to check what was regarded as a capillary ooze. Blood transfusion was begun.

During the next few hours the haematoma of the tongue spread to involve the whole organ, and swelling of the neck extended downwards, mostly on the right. During the course of the next day it became obvious that the larynx was being involved. Stridor was present and respiration was embarrassed, so that tracheotomy was necessary (54 hours after extraction). Actually breathing became extremely difficult on lowering the patient into the semi-supine position, and consciousness was lost just after incising the skin under local anaesthesia. On re-establishment of an airway with the tracheotomy tube, consciousness was recovered rapidly. The tracheotomy wound oozed continually and severe epistaxis started, and in spite of continued blood transfusion the patient died a few hours later, 66 hours after the extraction.

FIG. 1.—Specimen showing infiltration of blood into the mucous membrane of the larynx and upper part of the trachea.

Necropsy confirmed the presence of massive infiltration of the cervical tissues with blood, extending from the floor of the mouth and tongue down to the larynx and upper part of the trachea. The epiglottis and aryepiglottic folds were much swollen with blood and oedema in the submucosa, and the mucous membrane of the larynx and upper part of the trachea was infiltrated with blood, more marked on the right (Fig. 1). Careful search was made for a source of bleeding outside the gum, but none could be found.

Commentary

Several points of interest arise from consideration of this case:

1. *Source of Haemorrhage.*—The source of bleeding seems to have been a capillary ooze from the mucoperiosteum of the alveolus. Although external haemorrhage was controlled by stitches, blood must still have been escaping into the submucosa of the floor of the mouth. Extraction had been simple and trauma slight.

2. *Control of Haemorrhage in Haemophilia.*—It is doubtful if in the present state of knowledge it is possible to take adequate pre-operative measures to control haemorrhage in haemophilia. The time-honoured premedications with calcium and other agents are recognized to be of little value, the only promising one of these, according to Mead (1940), being intensive feeding with citrus fruit. Tainter, Thronsdon, and Richardson (1939) after an investigation of various agents concluded that "the results of this study leave no doubt that the agents commonly advocated for oral administration as haemostatics in dentistry are not effective when so used. The dental practitioner is advised to direct his efforts at controlling haemorrhage to local application of demonstrably effective agents rather than to try to speed up the coagulation processes by systemic medication." Perhaps the safest method of dealing with the problem is by slow exfoliation of the tooth, using a rubber band as recommended by Birch and Snider (1939).

3. *Path of Extravasation of Blood.*—A further point that arises is in connexion with the path of the blood down into the neck. It is quite clear that in this case blood extravasated from the floor of the mouth downwards through the base of the tongue in the plane above and behind the mylohyoid muscles and the hyoid, thus reaching the submucous tissues

of the aryepiglottic region and thence the submucosa of the larynx. It provides an admirable illustration of the path of spread of infection in Ludwig's angina.

A most important anatomical feature in the neck influencing the spread of inflammatory fluids is the musculo-membranous layer represented by the mylohyoid muscles, the hyoid bone, and the thyrohyoid membrane (Fig. 2). Infections of the floor of the mouth and submaxillary region can be considered clinically in two groups according to their anatomical relation to this layer, this being the most important factor in prognosis and treatment, especially with reference to involvement of the larynx. Cellulitis primarily

FIG. 2.—Diagram showing the relation between the musculo-membranous layer and the path taken by extravasated blood.

situated below the mylohyoid, as from a lymphadenitis of the submaxillary glands, if it extends downwards in the neck, will be superficial to the thyrohyoid membrane, and therefore does not endanger the larynx. Infections which are primarily in the submucosa of the floor of the mouth above the mylohyoid may easily track downwards, and will then be deep to the thyrohyoid membrane, thus involving the submucous layer of the larynx, this path of spread being well illustrated by the extravasation of blood in the case described above (Fig. 2).

Oedema of the larynx is therefore a complication essentially to be expected in infections above the mylohyoid—i.e., of the floor of the mouth or tongue. It is true that oedema of the larynx may complicate a superficial infection of the neck by spread along the stylopharyngeus to the laryngeal submucosa, as pointed out by Hamilton Bailey (1931), but this must be extremely rare. Oedema of the larynx is nearly always a complication of infection above the mylohyoid—that is to say, it is to be feared in true Ludwig's angina, and not in the

superficial infections of the neck below and anterior to the mylohyoid-thyrohyoid layer which are often incorrectly called Ludwig's angina.

It is fortunate, therefore, that most dental infections spreading out from the lower alveolus reach the periosteum on the labial border of the gum owing to the thinner layer of bone on this aspect of the alveolus (Hamilton Bailey). If infection spreads downwards it will then be superficial in the neck. In the region of the third molar the alveolar bone is thinner on the lingual side, and dental infections may thus reach the submucosa of the floor of the mouth; spread downwards will then be above the mylohyoid, in the base of the tongue—a true Ludwig's angina.

Summary

A case of asphyxia following dental extraction in a haemophiliac is described. Obstruction of the airway was due to massive haemorrhagic infiltration of the floor of the mouth.

Control of haemorrhage in haemophilia is briefly discussed.

The path of extravasation of blood and inflammatory fluids into the neck is discussed, the importance of the mylohyoid muscle layer being stressed. Oedema of the larynx is essentially a complication of infections above the mylohyoid, and very rarely occurs in infections superficial to this layer.

We are indebted to the Registrars at St. Bartholomew's Hospital and Guy's Hospital for access to old notes.

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INSULIN HYPOGLYCAEMIC COMA WITH A REPORT OF TWO FATAL CASES

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Before the introduction of protamine-insulin, deaths from insulin hypoglycaemic coma were very rare, and were confined to cases of gross overdosage with insulin or cases in which the sudden onset of coma caused the patient to fall into water or sustain serious injury. The ordinary hypoglycaemic attack was as a rule of short duration, and coma, if promptly treated, was practically never fatal. The records of the Auckland Public Hospital (800 beds) from the introduction of insulin to May 31, 1941, do not include a single fatal case. The possible effect of protamine-insulin, however, upon the character and outcome of hypoglycaemic coma has not yet been fully studied; consequently, the occurrence within a period of six weeks of two fatal cases in which the usual treatment was of no avail may be considered worthy of record.

Case I

This patient, a man aged 50, was drawing a military pension for achlorhydria. He had undergone an operation for ischio-rectal abscess in August, 1937, but urine tests do not seem to have been made. He was admitted to the Auckland Public Hospital on May 5, 1941, with 6 months' history of polyuria, thirst, and loss of weight and strength. His blood sugar was 374 mg. per 100 c.cm. This and all subsequent blood-sugar estimations were made by the ordinary method of Folin and Wu. He was quickly stabilized on a diet of carbohydrate 200 g., protein 80 g., and fat 90 g., with a morning injection of zinc-protamine-insulin 20 units and ordinary insulin 16 units. On this dosage he had for 11 days consistently shown a small amount of sugar in specimens taken at 9 and 11 a.m. and frequently also at 4 p.m., but those taken before breakfast and at night were for the most part sugar-free. To prevent this small daily loss of sugar the ordinary insulin was increased from 16 to 20 units on May 30, and the next day he was transferred to a Returned Soldiers' Hospital for further observation.

On June 3 he left the Soldiers' Hospital at 10 a.m. apparently quite well, and at 12.20 p.m. was readmitted to the Public