

a very extensive oedema is desired. Schleich admits that he has often seen "the early stages of cocain intoxication" produced by these means.

It is only in exceptional cases that we employ Schleich's method. Like Braun, we consider that so marked an oedema, as well as the injection of heterotonic fluid, in what Braun calls "Quellungsanästhesie," cannot fail to impair the tissue vitality and may retard the healing process. It is true that in Schleich's solution the irritative effects of the heterotonic solution, so far as pain is concerned, are masked by the addition of cocain. Nevertheless the irritative effects are there. C. Ritter,¹ in discussing the method by which nature relieves pain, has shown that inflammatory exudates, on account of their high concentration (with a freezing point of 0.76 compared with 0.56 of normal serum), induce a reaction with hyperemia and oedema till the difference in concentration is equalised.

In our opinion the older method of producing local anaesthesia is sufficiently effective, because the deeper tissues and organs are mainly insensitive. Lennander² deserves great credit for his excellent work on the sensitiveness of the viscera and tissues, in which he shows that a large number of deeply-situated organs can be dealt with without any form of anaesthesia. We shall refer to this point more fully in a later chapter.

A second reason why infiltration anaesthesia should not be carried to extremes is to be found in the increasing importance and practical value of "conduction" anaesthesia.

3. "Conduction" Anaesthesia. To H. Braun³ of Leipzig belongs the credit of having, as a result of careful researches, brought this method of producing analgesia into more general notice.⁴

If "conduction" anaesthesia has not been sufficiently adopted by the profession, it is because a more accurate knowledge of anatomy is required for its practice than for that of the infiltration method. No one, however, should operate by either method without considerable anatomical experience. Braun makes use of Spalteholz's excellent illustrations of the course of the nerves, more especially those of the extremities of which the majority of anatomical atlases are singularly neglectful.

"Conduction" anaesthesia is produced by a perineural or—after the nerve trunk has been exposed—by an endoneural injection of an isotonic saline solution of cocain. It is therefore essential that the operator must have a capable anatomical knowledge of the course of the nerves. Following Braun's example, we have introduced illustrations to show the points where the nerves will be encountered.

The method is almost identical with that described by Oberst in 1888, in which constriction was brought into use. Krogins utilised the method without constriction (v. History). Braun, however, was the first to demonstrate in the clearest manner that "conduction" anaesthesia is really produced by influencing the nerve trunk, and is not a variety of infiltration anaesthesia, while he further proved the advantages of simultaneous constriction, a point which had already been alluded to by Kummer.

For "conduction" anaesthesia less concentrated solutions of cocain are required, and the anaesthesia is produced more rapidly if the limb is constricted before making the injection. The constricting agent need not be firmly applied, for obstruction to the venous return is all that is necessary. A rubber band is placed round the root of the finger, into which, in the position of the four nerves there, 2 c.c. (30 minims) of a 1 per cent cocain solution are injected. Complete peripheral anaesthesia of all the tissues is produced within the space of five minutes. The addition of 1 to 3 drops of a 1 to 1000 solution of adrenalin acts in the same way as constriction by aiding and prolonging the action of the cocain.

The method of "conduction" anaesthesia may be employed in three different ways:—

¹ C. Ritter, *Arch. f. klin. Chir.* Bd. 69.

² *Grenzgebiete*, Bd. 10, and *Deutsche Zeitschrift f. Chir.* Bd. 10.

³ *Arch. f. klin. Chir.* Bd. 71.

⁴ We refer to his new handbook *Die locale Anästhesie*, Leipzig, 1905.