Dental anaesthesia : a paper on the merits and demerits of congelation, in dental operations / by Sidney Longhurst.

DENTAL ANÆSTHESIA.

A PAPER

ON THE

MERITS AND DEMERITS

OF

CONGELATION,

IN

DENTAL OPERATIONS.

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READ BEFORE THE COLLEGE OF DENTISTS OF ENGLAND, MAY 4, 1858.

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DENTAL ANÆSTHESIA.

Mr. President and Gentlemen.—

The object of this paper is to lay before the profession, a clear and concise exposition of the real value of Congelation in Dental Operations, *i.e.*, the extraction of teeth, &c., under the benumbing influence of intense cold.

For about five years, the subject has received a considerable share of attention; during which time opinions of the most conflicting nature have been current, *par. examp.*, A patient wishes to have a tooth extracted, but he dreads the pain, and he dreads chloroform. He hears of Congelation from a friend who is verbose in its praise, and who urges him to try it. He resolves. He, perchance, meets a second, to whom he intimates his intention, but is now told that, if he desires to pay twice the ordinary fee, to be fifteen minutes instead of as many seconds in the dentist's hands, and to suffer the usual amount of pain, he should by all means go. He consequently deems it desirable to obtain the opinion of his surgeon. That gentleman probably informs him that he has heard much of it, but has had no ocular or other proof of its efficacy in the matter, but desires him to consult his dentist. The dentist also, perhaps, frankly admits his personal inexperience, expresses his doubts, or stigmatizes it as a tissue of charlatanry. In this dilemma he resolves upon trying it, possibly comforting himself that it cannot, at the least, be worse. Or being at a dentist's, he summons courage, and the tooth is removed.

It is in such cases, and which are constantly occurring, that it is hoped this paper may be of service. The dentist or surgeon, although hitherto wholly inexperienced in the matter, may be enabled confidently to recommend or deter their patients, according to the case, and may judge with what appropriateness and truth, the extraction, &c., of teeth by Congelation, may be termed "painless."

What I shall here assert is not vaunted before you based on mere reading or vague hypothesis, but inferences drawn from actual practice. Not from a few isolated experimental cases, but from some hundreds, all of which I carefully watched, and accurately noted. The congealing process effected with no self-contrived appliances, but with the most efficient apparatus for the purpose yet constructed, known as "Blundell's Patent."

I am perfectly aware that the opinions set forth, will be found strangely at variance with those of previous authors, who may not be tardy with their replies and hostile criticisms, where vested interests are concerned. These I fear little, and shall heed less. In full confidence that, if they restrict themselves to a truthful representation of facts, fairly deducted from their entire practices—not sounding loudly a few successful cases, and carefully consigning the rest to oblivion,—their experience will tend, only, to corroborate my own.

To produce Congelation in order to alleviate the pain of an operation, or to congeal and render a part insensitive, for the purpose of obtaining the anæsthetic property of cold, a frigorific agent, or mixture, must be brought in contact with the part to be so benumbed. This, for dental purposes, is most conveniently brought about, by passing a stream of fluid, filtered from a freezing mixture of ice and salt, over the tooth and gums to be benumbed. A stream at 5° below zero (37 degrees lower than the temperature necessary to freeze water,) is thus readily produced. It will be obvious that, the shock of a current of such intensity passing *directly* over the tooth, would be productive of pain of no ordinary nature.

This, in the majority of cases is overcome, by allowing the stream at first to flow over the tooth at about 98°, the normal temperature of the mouth, by which a sensation of agreeable warmth is experienced. This is gradually reduced to from about 15°, 10°, or 5° above zero, according to the temperature of the season, apartment, or length of tubing the fluid has to traverse from the reservoir to the mouth—the greater the distance, the greater the loss.

The apparatus for the purpose—the construction of which we are indebted to Mr. Thornthwaite, of Newgate Street, but for the idea of the applicability of Congelation to dental purposes to Mr. Blundell, is this:—A gutta-percha reservoir, capable of containing three or four gallons, furnished with a perforated cylinder in its centre, is filled with finely planed ice and salt, two parts to one. Communicating with this reservoir so charged, by a tube and stop-cock, is a smaller vessel, of a size sufficient to hold about fifteen fluid ounces of water at 98°. To this a few feet of flexible tubing is attached, communicating with a waste vessel. This tubing, at a suitable distance, is divided, and in each end a small ivory pipe, four inches long, is introduced. These pipes are again connected by a tube of about an inch in diameter and two in length, of the finest India-rubber, thin to transparency. A pipe is placed on each side of the gum of the doomed tooth, and the loose membrane is allowed to hang over it. The stop-cock is now turned, the freezing fluid passes from the reservoir, and enters the small vessel of warm water, with which it gradually mingles, and displaces. The warm fluid is first forced out and along the flexible tube and first ivory pipe, inflates the thin membrane, which, as it expands, closely adapts itself to the gums and tooth, escapes by the second pipe and remainder of the tubing into the waste vessel, or may be carried entirely away. A small thermometer, the bulb of which dips into the interior of the tube through which the fluid passes from the graduator to the mouth, registers accurately the power of the agent employed.

It will be readily seen that, as the warm water is displaced by the greater density and volume of fluid from above, the tempera-

ture of the stream, which passes from thence and traverses the delicate membrane over the tooth, will be slowly and regularly lowered in temperature.

The time occupied in producing the anæsthetic effect by this method, is from six to about ten minutes. Depending entirely, as I shall hereafter show, does the success or failure of the whole, on the size, description, and position of the tooth, and the constitution of the patient. A much shorter time has been stated to suffice; but, like too many other reports which have been circulated respecting it, is unworthy of credence, and requires but little practice to refute.

The temperature of the freezing mixture will, of course, greatly influence the length or brevity of the procedure. It is difficult with the best apparatus and management, to get a stream traversing the membrane in the mouth at a temperature lower than 5° above zero, although the mixture in the reservoir may stand at 5° below. Ten or fifteen degrees are generally lost in the transit, though the tubes, &c., be of the best non-conducting materials.

It is easy to obtain frigorific mixtures of twice or thrice the intensity, but for all practical purposes the above will be found the most efficient.

A current, the temperature of which is higher than 16° or 20°, should never be employed. The expenditure of time it would involve, and the trifling anæsthetic effect produced, would be inadequate indeed.

Notwithstanding the care in graduating the temperature of the stream while passing over the tooth and gums, this part of the process is by no means always *painless*. Most heed it but little, but to a few it is almost insupportable; it is to all far from being agreeable. The sensation of pain or otherwise, is due to the development of the enamel. Teeth, the crowns of which

are traversed by deep pits and fissures, are the most sensitive; those, in fact, which are the more readily "set on edge" by cold water, acid fruits, &c. It is not always the diseased tooth to which the cold is directly applied that occasions the suffering, but frequently those adjacent.

That part of the mouth, only, is subject to the congealing process which immediately surrounds the offending tooth. The investing gums in contact with the current assume the appearance of *white wax.* In this state the tooth is quickly extracted. Blood, as usual, flows freely from the wound. The gums immediately resume their natural colour, but the sensation of numbness continues for some minutes. Too rapid return of the circulation is, in a measure, prevented by the use of iced water.

On the second or third day after the operation, the gums recently congealed become pale, white, and sore. The epithelium peels off, and becomes again healthy. More than this need never be apprehended if the refrigeration be not carried too far.

The amount of pain abolished by this procedure differs greatly, as I have before stated, in different teeth, and different subjects. This to those who may be inclined to argue, "a tooth is a tooth," may seem paradoxical, but will cease to be so when it is remembered that,—Anæsthesia by Congelation is purely local, not general, as is chloroform;—That anæsthesia by Congelation is not *absolute* as is chloroform, but in the smallest number of cases, such as small teeth, stumps, &c., those in short, which would cause but little suffering if extracted in the ordinary way;—That of the sixteen pairs of teeth in the human jaws, there are no two exactly alike, all differing more or less in size, shape, or number of fangs. It is therefore obvious, that a tooth with three roots will be productive of more pain in its removal than a tooth with one—a tooth with a long thick fang than one with a short small one—the pain inflicted, being in almost an exact ratio, to the amount of physical force necessary to extract it.

The position, articulation, and greater density of the bone of the lower jaw, render the success of Congelation in the removal of lower teeth much less certain than upper. It is of great importance that, during the refrigeration, the mouth should be kept dry. All moisture coming in contact with the membrane is converted into ice: even the breath condensing upon it, assumes the appearance of hoar frost. The saliva, gravitating to the lower part of the mouth, insinuates itself between the membrane and the tooth, and there freezes, forming over it a complete capsule and shield of ice. Ice usually being but 32° (a temperature almost useless for anæsthesia), and a bad conductor, the tooth and gums will often remain at that temperature, uninfluenced by the more intense cold passing through the membrane above. The effect in such cases is often a mere bagatelle. The quantity of saliva secreted by different individuals differs greatly. In some it is easily absorbed by placing small napkins over the ducts, or with a syphon; in others it will defy our best efforts. With the upper teeth we are not so troubled.

The constitution of the patient is next for consideration. I need scarcely remark that, insensibility of a part produced by Congelation is effected, by causing a contraction of its vessels, and a consequent expulsion of its blood. The more nervous and vascular the part, the more sensitive and susceptible of pain. The pale, anæmic child, feels not pain so acutely as does his ruddy companion of the same age. Mercifully is it so ordained. His are the broader shoulders who carries the heavier burden. I would here quote Dr. Branch, of America, one of the few of any experience who has written at all impartially on this subject. He writes, "It is like all agents coming from God's hand direct, most powerful and most useful where most needed, viz., enfeebled and nervous constitutions, while the robust and hardy resist its action with a tenacity which *sometimes* renders it almost a nullity." It will be seen, then, that the paler and more enervated the patient, the fitter subject for Congelation..

Of about three hundred cases in which I have operated with Congelation, I have had but two cases of large, firm, grinding teeth, of which I can assert, on the statements of the patients, there was literally NO *pain.* These were both upper wisdom teeth, teeth which every dentist knows are more easily removed than any of the large molars. In both cases the cold was continued an unusually long time; the consequence was, that in one, the wound was more difficult and troublesome to heal, than any other I have seen.

The following cases may tend for illustration:—Two maiden ladies, introduced by Dr. Arnott, called to have teeth removed by Congelation. The one, two apparently firm teeth, but from which the gums and alveoli had absorbed, allowing them to be easily extracted: the case, of course, gave great satisfaction. The second lady wished to lose three, two of which were scarcely more than attached by the gums; the third, a lower bicusped, was alone firm. The first two, as may be imagined, were scarcely known to be out; the third she remarked was "rather sharp." This to the ladies was considered the perfection of Congelation, and elicited a most eulogistic letter to Dr. Arnott on the subject. That gentleman, a few days after, sent a third patient, a young lady of about fourteen years of age, from whom it was desirable to extract three of the large permanent molars, all hopelessly decayed. A painless operation had been promised her. Congelation was applied to the first, and I quickly extracted it; but not before the usual sharp cry had echoed through the apartment. This lady, doubtless, returned to Dr. A. with experience strangely contradictory to that of the former patients. The cause may be briefly told. The teeth of the first were those which Nature herself was endeavouring to expel, and would soon have accomplished. The last was that of a ruddy, healthy girl, with teeth firmly implanted, to bear the wear and tear of threescore years.

The following is also a case of singular significance. A lady was brought by the late Dr. Edwards for the removal of a tooth.

The doctor himself being dubious as to the efficacy of the agent for the purpose; the lady equally so. Dr. E. requested they might be permitted, first, to witness an operation. The request was granted. A patient, a robust servant girl, was found with a troublesome tooth, a second lower molar. Congelation was produced in their presence, and the tooth extracted, but the cry it elicited was all-potent in preventing the lady from becoming herself a patient.

From these cases it may be inferred that Congelation is useless Such an impression I should be sorry to give. But that in many cases it *is* useless—nay, more, that in a few cases it is even worse than useless, I hesitate not to affirm. For the robust and vigorous to use it for the extraction of a tooth, I consider it an idle farce; for the weak and shattered invalid, a grateful boon.

In *all* cases of extraction, an *alleviation* of the ordinary pain may be confidently promised and expected. When I say that in a few cases it is useless and worse than useless, I infer that, the amount of pain abrogated in some instances is so trivial, as to be quite inadequate to the extra inconvenience, disappointment, expense, and sacrifice of time.

The cases in which Congelation is found of most value, are those of ordinary stump extraction. The universal repugnance attending it, its constant occurrence, and the facility with which it is usually performed, tend to cover many defects. Much less time is required for the congealing; until the gums are blanched will generally suffice Many roots, when approximating, may be readily extracted with one freezing. I have often removed four or five with little or no pain. When deeply seated, a more lengthened application will be necessitated.

There is, however, one class of stumps, for the mitigation of pain in the extraction of which, Congelation will be found to play but a sorry part. It is the fangs of the large molar teeth, the crowns of which have been recently fractured in their attempted

removal. Such cases are among the most difficult the dentist has to perform, and in which both patient, and operator, will find Congelation but a miserable helpmate.

Of the merits of this agent in the operation of Pivoting, I would willingly pass over; the title of my paper, however, precludes it. Having had no actual experience in it, in that operation individually, in consequence of patients for Congelation always preferring the entire removal of the tooth, an incisor being productive of so little pain, rather than risk the success of a painless excision and pivoting,—a success which, from my other experience, I should be unwilling for my own sake to promise, and for my patients to risk—my evidence can be but circumstantial: that evidence, however, would at once condemn it without qualification. Its commendation for this purpose by other writers, after witnessing the absurd way in which its value in tooth extraction has been lauded and exaggerated, I am sorry to add, has not the slightest weight with me. One case of its use in pivoting, and its utter inapplicability and failure, I received through a channel, the veracity of which excludes a doubt. Physiology, that glittering shield under which its imperfections in practice have vainly sought shelter, here forsakes it. It has been often answered to the pertinent query, "Why is not frost-bite of the gums produced by the application of such intense cold?" "Because the blood-vessels are relieved from congestive reaction, by being cut across or lacerated in the operation." In pivoting, there is no cutting or lacerating of the gums, and frost-bite *is* and *was* the result in the case alluded to. Some attribute the exemption from frost-bite to the use of iced water after the operation, thereby graduating the return of the circulation. The theory is good and may be humoured, bnt the effect trivial.

The use of Congelation in Staphylorophy has been occasionally attempted, but so far as the results have come to my knowledge they have been unsatisfactory. Of a case operated on by Mr. Field, of Brighton, he speaks thus: "I tried, with the assistance of some medical friends, to produce Congelation of the palate by

means of pounded ice and salt, but in this we totally failed, even after more than an hour's perseverance. Our failure is attributable I suppose to the naturally high temperature of the parts, and the currents of warm air through the mouth and nose, to both of which the freezing mixtures would be exposed. Had we succeeded, the advantages to be gained are evident, as all pain would have been saved to the patient during an operation, which might have been accomplished in a very short time, and no interruption would have been occasioned by bleeding." So far as the failure in producing Congelation is concerned, I attribute it solely to the method I imagine was adopted—that of applying small bags of ice and salt, one after the other, to the palate. With the apparatus as described at the beginning of this paper, Congelation of the palate is easily effected. But of the advantages to be derived in the operation in question, I am not so sanguine. A next to painless operation might undoubtedly be anticipated, but that most dreaded result in staphylorophy—sloughing, would certainly be more liable to supervene.

The reported efficacy of this agent in curing tooth-ache and plugging teeth, is lastly for consideration. Here again we unfortunately find physiology and Congelation pitted against each other. Tooth-ache may be attributed, in the majority of cases, to a morbid enlargement of the dental pulp and fibrils, causing a pressure on their osseous non-elastic walls; or extraneous matter in the cavity of the tooth setting up irritation. When cold is applied, the inflamed vessels contract, and the pain ceases. But the result of all severe cold is violent reaction—inflammation. The pulp on the removal of the cold, swells as before. The pressure is renewed, and the pain returns as badly, or worse than before.

The same objection exists, but in a less degree, to cold in stopping teeth. Unless the exposed nerve and fibrils are actually cut across and destroyed while the tooth is cold, the same results will accrue. It is possible, that with the most careful management, Congelation may, in some cases, be made of trifling value

in the hands of those who possess willing patients, and time to expend over it. Those who have never used it for this purpose have little to regret.

A comparison has been often made between chloroform and Congelation in the extraction of teeth. A comparison which, regarding them purely as anæsthetics, is about as idle as one would be between the sun and moon as luminaries! With chloroform we have no crochets as to size, form, position, &c., &c.; one tooth, or all, can be removed equally, and absolutely painlessly. Let it not be inferred that I would use or recommend chloroform indiscriminately. Few are more keenly alive to the gloomy fact, that an awful casualty may happen to anyone, at any moment, without a murmur of warning. From this, at least, Congelation is exempt.

It has been a very general impression that, the intense cold applied to the tooth to be removed, and always operating more or less upon the neighbouring teeth, must have a prejudicial effect on them. Throughout all ages the opinion that extreme cold influenced the teeth injuriously has had credence. We find Hippocrates writing, "*Frigidum inimicum ossibus dentibus nervis cerebro spinali-medulæ; calidum varo utile.*" My own observations, however, tend to add but little weight to such testimony. I do not go the length of the assertion of many, that such intense cold is perfectly harmless. I am inclined to regard all extremes as preternatural, and consequently bad, unless used therapeutically to a part already morbidly affected. Nevertheless, I must in all fairness add, I have never once found the adjoining teeth, which have been unavoidably partly frozen, to suffer in consequence.

I attribute the pain in the teeth on the application of cold to a cause diametrically opposed to that to which ordinary tooth-ache is attributable. The one, as I have had occasion to remark, is usually due to the swelling of the vascular contents of the tooth upon its unyielding walls. In the case of its production in

a healthy tooth by cold, to the contraction of the walls upon their contents. A circumstance which may, in a measure, be avoided, by capping the approximate teeth with wax or gutta percha. Teeth, the crowns of which are deeply pitted and furrowed, are sooner and more painfully influenced, from the fact of the cold more readily gaining access to the sensitive structure beneath the enamel, without being subjected to the graduation necessitated, when applied to a tooth the enamel of which is solid and impervious. The enamel being insensitive, acts as a natural graduator.

I have operated with this agent at various times before Drs. Arnott, Druitt, Hansom, Edwards, Pett, Branfoot, Laurence, and other gentlemen who have felt interested in the matter, at all times with varied success, according to the triviality or difficulty of the case. By some, of course, it was justly eulogised; by others, as deservedly condemned.

I have now, to the best of my ability, laid the subject before you in its bare reality. I have withheld nothing, for, or against. I have showed it you in its brightest and its dullest colours, its fairest and its ugliest aspects. And it is only my regret, both for ourselves and our patients, that its "merits" and its "demerits" are not more evenly balanced.

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