

RESUSCITATION UNDER ANESTHESIA SOME INTERESTING EARLY REPORTS

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ALTHOUGH there is great enjoyment in original discovery, there is also satisfaction in rediscovering forgotten material. The late Noel Gillespie drew attention to "rediscovery" in his excellent book, "Endotracheal Anaesthesia."¹ As his illustration of rediscovery, Gillespie used the bulb on the inflating tube leading to an endotracheal catheter cuff. Reference was made to the presence of such a bulb on Eisenmenger's² tube in 1893, and to Green's³ suggestion of it in 1906, and Hewer's⁴ in 1938. It is interesting to note in Green's original paper that he gives credit to Professor J. A. Blake, "who outlined the form of intralaryngeal cannula" (the indicator bulb on this form of catheter was located at the mouth end of the endotracheal catheter, and not on the lead-in tube). If one ventures further back in medical literature, it will be found that the cuff on the original Trendelenburg tube⁵ was filled from an India-rubber balloon that acted as an indicator bulb while filling the cuff. Junker's description⁶ illustrated this: ". . . the point of the India-rubber balloon fixed to the inflation tube of the tampon, which is then expanded by gentle compression of the balloon. A certain resistance shows that the plug is sufficiently filled and in close apposition to the walls of the trachea. . . ."

Another example of rediscovery was in the 1951 article of M. H. Armstrong Davison⁷ calling attention to Kite's use of "an instrument to pass beyond the glottis" for inflation of the lungs. Kite's work showed great foresight; but unfortunately, the report was lost or forgotten long before surgical anesthesia was introduced. Had Kite's instrument been available, it seems likely that Henry Jacob Bigelow would have used it in what was prob-

ably the first successful intratracheal resuscitation of a patient under anesthesia. Bigelow is well known to anesthesiologists as the author of the first complete paper on surgical anesthesia,⁸ even though his paper was by three weeks preceded by a Letter to the Editor from E. R. Smilie,⁹ in which he told of rendering his surgical patients insensible to pain by having them inhale the vapor from a warm ethereal solution of opium. Although Fulton and Stanton list Smilie's paper¹⁰ under "opiates," Smilie was very possibly inducing ether analgesia 110 years ago!

Bigelow's case of resuscitation under anesthesia occurred June 19, 1867, but was not reported until Beach¹¹ published an account of it in 1884. As Bigelow's house pupil at the Massachusetts General Hospital, Beach had written the summary of the case for the hospital records, and he reprinted the summary in his 1884 paper, saying, "The following transcript from the hospital records, then written by myself (Vol. 129, p. 159), may have some interest for the profession." The case report follows:

Patient, thirty-nine years old, enters hospital with a tumor of left side of face, extending over a space of about two inches in diameter, being adherent to the facial and zygomatic surfaces and malar process of the superior maxillary and the inner surface of the malar bone. It protrudes one half of an inch beyond the zygomatic process of the malar bone, extends into the antrum, is elastic, has a uniform surface, and of late has grown rapidly. One year and a half ago a tumor was removed from the facial surface of the superior maxilla of that side.

Operation. Dr. Bigelow made a semilunar incision of five inches, from the commissure of the lips to the middle of the space between the eye and the ear; a straight one from the septum of the nose through the upper lip, and dissected up the flap to the border of the orbit. At this point respiration stopped; the surface of the body and extremities became livid and cold, although the haemorrhage was inconsiderable and she was not inhaling ether. The head was immediately lowered, the feet were elevated, and the patient, who had not respired for eight or ten seconds,

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during which the pulse had continued to beat, was suddenly found to be pulseless. The operation was stopped, and the usual efforts were made to induce her to breathe. A catheter was passed into the trachea by the mouth, through which air was blown unsuccessfully. Two or more minutes had now elapsed without pulse or respiration, the operator expecting, as not infrequently happens, a full respiration with some gurgling from collected blood; but it was now evident that no time was to be lost. Dr. Bigelow opened the trachea with one stroke of the scalpel, and then with his mouth sucked a certain amount of liquid blood from the trachea, at the same time inflating the lungs by passing the catheter down the trachea through the opening *beyond the point of obstruction*; galvanism was then most thoroughly applied to the cardiac region, but it was only after the lapse of what seemed to be from five to eight minutes that the first inspiration took place. During five minutes more the patient was unable to breathe without inflation, after which her breathing was good and the pulse returned. Both increased in strength and frequency until it was thought best, after consultation with Dr. J. Mason Warren, Dr. Clark, Dr. Cabot, Dr. George H. Gay, and Dr. Hodges, to continue the operation and remove the diseased mass. The zygomatic arch, the external angle of the orbit, the palantine arch between the second incisor and canine teeth, and the nasal process of the superior maxilla, were successfully divided by a bone forceps. Upon prying the jaw down from its attachments, it crushed like an egg-shell, having become thinned by absorption. The debris were removed together with the tumor, which was lobulated, friable, and very vascular. General oozing was checked by sponges dipped in liquor ferri subsulphatis. Six vessels required the ligature. Wound closed with sutures.

The report of passing a catheter into the trachea by mouth is most interesting, as is the statement that galvanism was applied to the cardiac region. Beach's report does not reveal whether ether vapor was introduced through the tracheostomy catheter. If the anesthetic was administered through the catheter it would have preceded Trendelenburg's introduction of intratracheal anesthesia by two years. After 1880, there is evidence that Bigelow's procedure for intratracheal inflation was appreciated in problems of resuscitation,^{11, 12, 13} even if it were not used as an anesthetic technique. Following is an excerpt from Richardson's report¹² in 1882:

Hardly had the operation begun when the child ceased to breathe. . . . The child was black in the face, and had not inspired any air whatever for at least three minutes. . . . I introduced a

large sized gum-elastic catheter and expanded the child's lungs fully. An assistant then compressed the thoracic walls with considerable force. By this means a large amount of blood was expelled from the trachea, and two or three repetitions of the process were followed by natural successful attempts of the patient to breathe.

The discussion published with Richardson's paper probed basic problems. Dr. Porter analyzed the dangers of anesthetics and pointed out ". . . first, spasm of the glottis often results from ether." He advocated resuscitation in a manner similar to Richardson's. A case of attempted suicide, mentioned by Dr. Beach in his article,¹¹ was subsequently published by Dr. Gay.¹⁸ His patient had shot himself through the mouth, and an operation was performed under ether to remove the bullet. The patient ceased breathing; Bigelow's procedure was then employed to re-establish respiration. The discussion of Richardson's paper by Dr. Bolles seems quite advanced:

Unless he has some special apparatus for the purpose, the surgeon should *always* carry to a tracheotomy a large elastic catheter, and a syringe fitting it, capable of either suction or expulsion of air,—to assist either in inflating the lungs or expelling mucous blood or membranes.

"In two cases where the operation was performed on patients in a condition of great exhaustion, apparently just before the end, where respiration and action of the heart had both ceased, so far as could be seen or felt, the Faradic battery, *ready for instant use*, restored both functions after artificial respiration and other stimulants had failed. The battery should not only be carried, but set up—with all connections made, and the electrodes attached.

Just as Bigelow's name reappears in American medical literature of the late nineteenth century, Sir Spencer Wells' name appears several times during that same period in British literature. Wells is probably best known to anesthesiologists for his use of curare in the treatment of tetanus.¹⁴ Junker in his paper⁶ pointed out that Wells had adopted the Junker anesthesia machine for delivery of anesthetic vapors during surgery. Wells also advocated exchange transfusions with saline for resuscitation under chloroform anesthesia (a small amount of ammonia was added to the saline to help keep the blood in a fluid state). Experimental work on this last sub-

ject was carried out by C. E. Jennings.¹⁵ Jennings was to have presented a discussion of Wanscher's paper on rectal etherization at the International Congress of Medical Sciences in Copenhagen in 1884, but instead of discussing Wanscher's work, Jennings presented a paper about his own work, to prove that "even after death has actually occurred, life may be restored." Working with dogs, Jennings gave chloroform anesthesia until the pulse and respiration disappeared. He then transfused as advocated by Wells, and reported: "Where this procedure has been adopted within 2 min. 40 sec. after death comes, life has returned." Jennings also knew the value of artificial respiration, and wrote: "Where life is threatened by asphyxia during chloroform administration, either the epiglottis should be drawn forward with von Brunn's forceps, or tracheotomy (and artificial respiration) instantly performed. Before chloroformization, the exhibition of sal volatile, the subcutaneous injection of morphia and atropine is strongly recommended."

It would be interesting to know whether Jennings or Wells tried an exchange transfusion on a human patient as a means of resuscitation, but such evidence has not been revealed to date by a search of the literature. It is possible that an answer to this particular question may never be found. It is certain, however, that during the search, more and more articles will be rediscovered indicating that less and less of what we do today in medicine is really new.

SUMMARY

Attention is called to the constant process of "rediscovery" in medicine. In particular, several early references to resuscitation under anesthesia are presented and in part quoted.

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