

# Somnoforme: A Century After the Introduction of the “Ideal” Anesthetic Gas

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## ABSTRACT

Since the introduction of ether as a general anesthetic, there has been a continuous quest to develop the ideal anesthetic gas. The attributes of the ideal anesthetic gas have evolved over time. At the beginning of the 20th century, the search for the ideal anesthetic was focused upon finding an anesthetic gas with rapid inhalational induction and rapid emergence that could be delivered without cumbersome apparatus and would have limited potential for toxicity.

Somnoforme was a mixture of ethyl chloride, methyl chloride, and ethyl bromide designed to provide powerful efficacy with low potential for side effects by blending of several volatile vapors. Somnoforme was developed by Dr. Georges Rolland, Director of the Dental School in Bordeaux and first formally presented to the Congress of the French Association for the Advancement of Sciences on September 10, 1901. Somnoforme was rapidly embraced as the ideal general anesthetic for short operations. E. de Trey & Sons of Philadelphia, American distributors for Somnoforme advertised it as “The Ideal General Anesthetic for Dental and Minor Operations”.

Dr. Rolland's intention was to blend already well-known drugs into one mixture from which the respective advantages of each one could be obtained and corresponding effects produced without having many of the inconveniences and the same degree of danger of the individual drugs. Methyl chloride was believed to be contribute to the rapidity of induction of general anesthesia, ethyl chloride to maintenance of anesthesia and ethyl bromide to postoperative analgesia. It was so easy to administer that formal medical training was considered unnecessary. The pulse appeared to strength under somnoforme anesthesia and depth of anesthesia would briefly increase after removal of the mask which was particularly advantageous for dental procedures.

However, enthusiasm for somnoforme was transient. In part, this was because somnoforme failed to meet the contemporary definition of an ideal anesthetic gas since it had significant potential toxicity. In part, this was because E. de Trey & Sons were accused and pleaded guilty to the charge by the United States Government of mislabeling their product (newly a crime under the Pure Food & Drug Act of 1906) since it failed to contain any ethyl bromide. And finally, this in part due to the fact the desired attributes of the ideal anesthetic gas have evolved over time to include nonflammability. After a brief period of enthusiasm, Somnoforme saw limited use until it was totally abandoned in 1931.

## INTRODUCTION:

Less than a year after Morton's public demonstration of ether anesthesia, the first mortality from ether was reported. The first chloroform-related fatality was reported a year later. The recognition that ether and chloroform were imperfect agents that could harm created a keen interest to develop the ideal anesthetic gas. At the beginning of the 20th century, the search for the ideal anesthetic was focused upon finding an anesthetic gas with rapid inhalational induction and rapid emergence that could be delivered without “cumbersome apparatus” and would have limited potential for morbidity or mortality.<sup>1</sup>

## THE RISE OF SOMNOFORME:

Somnoforme was developed by Dr. George Rolland, Director of the Bordeaux Dental School and first formally presented to the Congress of the French Association for the Advancement of Sciences on September 10, 1901. Somnoforme was a mixture of ethyl chloride (60%), methyl chloride (35%), and ethyl bromide (5%) designed to provide powerful efficacy with low potential for side effects by combining several anesthetic gases. Dr Rolland's goal was “to blend already well-known drugs into one mixture from which the respective advantages of each one could be obtained and corresponding effects produced without having many of the inconveniences and the same degree of danger of the individual drugs.”<sup>2</sup> Methyl chloride was believed to contribute to the rapidity of induction of general anesthesia, ethyl chloride to maintenance of anesthesia and ethyl bromide to postoperative analgesia.

The major American distributor for somnoforme, E. de Trey & Sons of Philadelphia, advertised it as “the ideal general anesthetic for dental and minor surgical operations.”<sup>3</sup> (figure 1) This sentiment was echoed in the scientific literature which soon lauded somnoforme as “the ideal general anesthetic for short operations.”<sup>4</sup> It was so safe and easy to administer that formal medical training was considered unnecessary. The pulse appeared to strengthen under somnoforme anesthesia.

In fact, Dr. Rolland allowed himself to be anesthetized with somnoforme while his radial artery pulse was monitored with a sphygmograph. The resultant pre-anesthesia and intra-anesthesia pulse tracings (figure 2) were published in the Journal of the British Dental Association in 1902 and demonstrated an increased amplitude of the arterial waveform under anesthesia.<sup>5</sup> This made somnoforme remarkably different than ether or chloroform.

In patients receiving somnoforme by inhalation, blood pressure increased without significant change in heart rate or respiratory rate<sup>6</sup> (figure 3). Rapid inhalational induction without excitation was viewed an important advantage over contemporary anesthetics.<sup>7</sup> The de Trey inhaler was the preferred delivery device since it was light-weight, simple, and resistant to damage. (figure 4) Somnoforme was conveniently packaged in small ampoules (figures 5) as opposed to nitrous oxide which required larger and more awkward containers. The tapered end of the glass ampoule would be broken within the handle of the inhaler, soaking the cotton with the highly volatile somnoforme liquid.<sup>8</sup> (figure 6) The patient would be instructed to breathe deeply from the face mask for up to 30 seconds, but induction of anesthesia rarely took more than 20 seconds. With the reservoir bag attached, the apparatus formed a closed system to prevent the escape of the volatile somnoforme; room air was not entrained into the system and the patient was rebreathing all expired gases. Some somnoforme inhalers were designed to allow the optional entrainment of room air for use in longer procedures. After removal of the face mask, depth of anesthesia appeared to briefly deepen, which was particularly useful for dental procedures performed prior to the advent of endotracheal intubation.

Somnoforme was well-received by patients. Although disorientation on emergence from anesthesia was common, patients rarely reported dysphoria. The sensation was typically described as “gaiety, joy, rapture, anger, or religious ecstasy.”<sup>9</sup>

## THE DEMISE OF SOMNOFORME:

However, clinical enthusiasm for somnoforme was short-lived. It received limited usage outside of dentistry and even dentists quickly abandoned the anesthetic whose properties they had initially praised. Four factors caused this. First, the general anesthetic effects of the primary component, ethyl chloride, were extremely transient and without significant muscle relaxation, so the anesthetic efficacy was limited to dental or brief superficial procedures. Secondly, the mixing of several gases did not mitigate the dangers of the individual components and ethyl chloride was found to have a safety profile comparable to chloroform.<sup>10</sup> Chloroform was generally considered too dangerous for administration by dentists. Thirdly, the reputation of somnoforme was irreparably tarnished when an American distributor was discovered to be intentionally omitting the ethyl bromide component. Mislabeling pharmaceutical products was a newly designated crime under the Pure Food & Drug Act of 1906. E. de Trey & Sons pled guilty to this charge after government chemists analyzed the somnoforme being sold in the US and failed to detect any ethyl bromide.<sup>11,12</sup> And finally, the desired attributes of the ideal anesthetic gas expanded to include nonflammability after the introduction of electrocautery to surgical procedures in 1926. After a brief decade of clinical popularity, somn forme saw diminishing use until it was totally abandoned in 1931.



Figure 1. Journal advertisement from 1906.

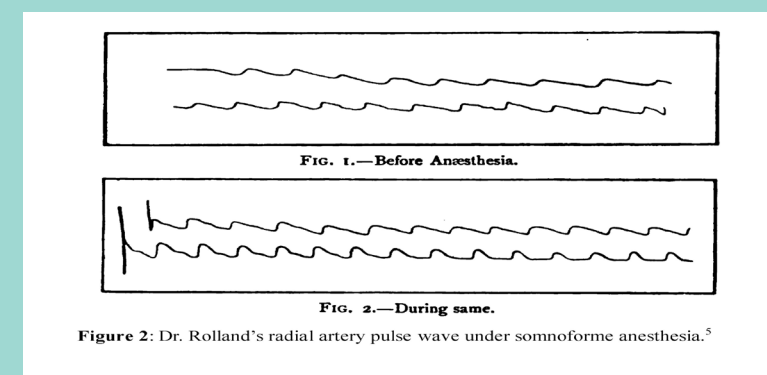


Figure 2. Dr. Rolland's radial artery pulse wave under somnoforme anesthesia.<sup>5</sup>

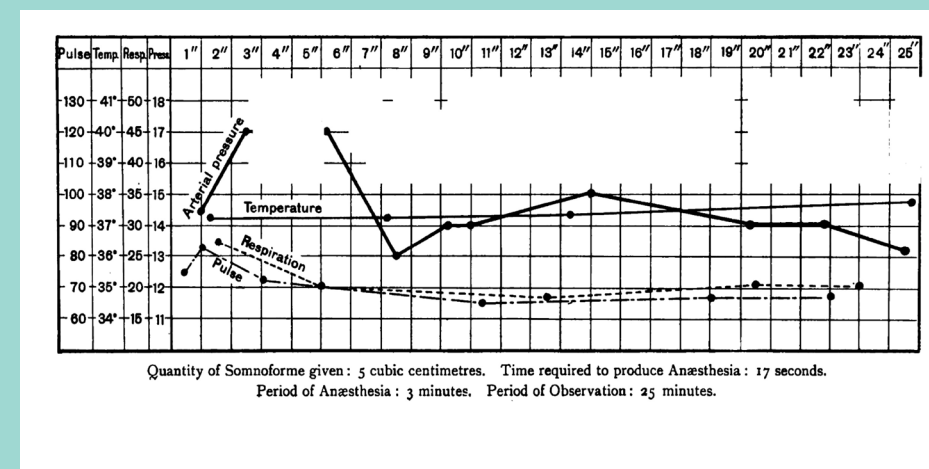


Figure 3. The hemo-dynamic effects of Somnoforme. <sup>6</sup>



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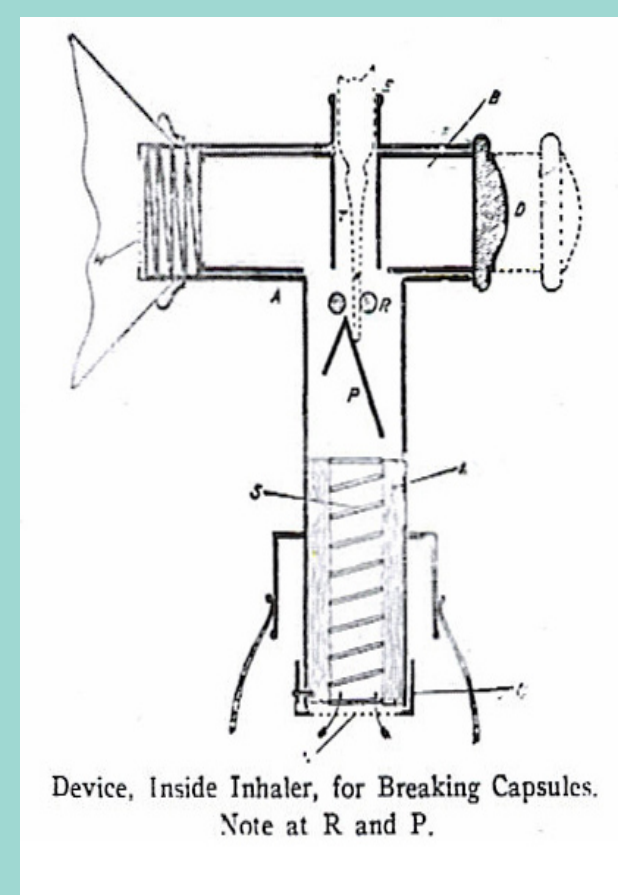


Figure 6. Internal schematics of the de Trey inhaler as depicted by Dr. William H. de Ford. Dr. de Ford de-livered tens of thousands of somnoforme anesthetics and later introduced a somnoforme inhaler bearing his name, the de Ford inhaler.



Figure 5. An ampoule of highly volatile somnoforme (from the collection of the author)

## CONCLUSIONS:

In retrospect, the proclamation of the formulation of an “ideal anesthetic” was premature as that search continues to this day. However, even some contemporary physicians were skeptical and offered sage wisdom which endures a century later. In response to claims of new “safe” anesthetics, an editorial in The Medical Times from January 1908 came to this astonishingly modern conclusion.

“Claim has been made for the newer anaesthetics that they are much safer than the old. But an absolutely safe anaesthetic is a contradiction in terms...An anaesthetic which will induce insensibility sufficiently deep for satisfactory surgery must in the nature of things stand for some danger; anyone profoundly anaesthetized is always very near the border line between life and death...The reason the patient so rarely goes beyond the border line lies not so much with the agent employed as in the skill of the experienced anaesthetizer, who knows the properties of the drug he uses; who, after a thorough examination, has taken all precautions, who foresees all possible “accidents,” who will not trust to luck, and who remains vigilant throughout and until the patient returns to consciousness.”<sup>13</sup>

## REFERENCES:

1. Rolland G and F. Robinson. Somnoforme. J Brit Dent Assoc 1902;23:321-33., p 321.
2. G Rolland quoted in Proxmire TS. Somnoforme, the new anesthetic. The Clinique. 1905;26:258-9.
3. Somnoforme Advertisement in Dominion Dental Journal 1906;35:xxiii.
4. Osborne JR, Patterson S, Carr GA. Somnoforme versus Nitrous Oxide. Proc NC Dental Soc. 1906 published in Fleming JM, Thirty-Second Annual Meeting of the North Carolina Dental Society. (Raleigh: Commercial Printing Company, 1912), pp 29 – 35.
5. Rolland G and F. Robinson. Somnoforme. J Brit Dent Assoc 1902;23:321-33., p 323.
6. Rolland G and F. Robinson. Somnoforme. J Brit Dent Assoc 1902;23:321-33., p 327.
7. Otrolengui R (ed) Items of Interest: A Monthly Magazine of Dental Art, Science and Literature. Vol 27 (New York: Consolidated Dental Manufacturing Co., 1905), pp 904-5.
8. De Ford WH. Lectures on General Anaesthetics in Dentistry: Advocating Painless Dental Operations by Use of Nitrous Oxid, Nitrous Oxid and Oxygen, Chloroform Analgesia, Ethyl Chloride and Somnoform. (Kansas City, Franklin Hudson Publishing Co., 1908) p 185.
9. Rolland G and F. Robinson. Somnoforme. J Brit Dent Assoc 1902;23:321-33., p 326.
10. Stewart HB. The volatile anesthetics-ether, chloroform, ethyl chloride and divinyl ether. Anesthesiology, 1941;2:635-40.
11. Nostrums and Quackery: Articles on the Nostrum Evil and Quackery Reprinted, with Additions and Modifications, from the Journal of the American Medical Association. (Chicago: American Medical Association Press, 1912), p 546.
12. Thornton WW. The Law of Pure Food And Drugs. (Cincinnati: The W.H.Anderson Co., 1912), p 559.
13. Hills AK (Ed). Medical Times: A Monthly Journal of Medicine, Surgery, and the Collateral Sciences, (New York: No. 541 West End Avenue, January 1908), p 28.