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Landmarks and Legacies

William Ladd before the Halifax explosion

Don K. Nakayama *

Department of Surgery, Florida International University, Sacred Heart Medical Group, Pensacola, FL

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ABSTRACT

Legend holds that treating the hundreds of children injured in the Halifax explosion of December 6, 1917, compelled Dr. William E. Ladd (1880–1967) to dedicate his career to the surgical care of infants and children. However, he had made the commitment to be a pediatric surgeon several years before when he joined the voluntary staff of the Children's Hospital of Boston in 1910. In the years before Halifax, he was among the vanguard of American surgeons who brought the mortality of intussusception to 45% from 90%, and of pyloric stenosis to 15% from 60%. Among his early innovations was the contrast enema for intussusception for diagnosis and therapy. Shortly after the explosion, Dr. Ladd led a medical relief effort of 100 doctors, nurses, and orderlies from Boston. With supplies enough for a 500-bed hospital, they battled through a blizzard, downed telegraph lines, and blocked railways to reach the strickened city on December 9. The enormity of the Halifax tragedy and the dedication of Dr. Ladd and his team led to the creation myth of the birth of pediatric surgery. The record was set straight by Dr. Ladd himself in a handwritten letter to a pediatric surgeon who had asked about when he dedicated himself to the field. "The Children's was [my] very first and most permanent love," Ladd wrote. "As soon as it became feasible after the first World War, I devoted myself exclusively to pediatric surgery and have never regretted it."

Contents

1. Intussusception . . . 2093
2. Pyloric stenosis . . . 2094
3. The Halifax explosion and Ladd . . . 2094
4. The creation myth . . . 2094
5. Setting the record straight . . . 2096
References . . . 2098

According to legend, the scores of children injured by the Halifax explosion on December 6, 1917, one hundred years ago this month, compelled Dr. William Edwards Ladd (1880–1967) to devote his career to the surgical care of children. However, several years previously, he had already made that commitment. By the time he led the Halifax relief effort days after the explosion, he had made substantial contributions to the care of infants with intussusception and pyloric stenosis. (See Figs. 1–4.)

He joined the voluntary staff of the Children's Hospital of Boston in 1910, just a few years after his graduation from Harvard Medical School in 1906, and the completion of his training in general surgery at the Boston City Hospital in 1908. Well trained, his surgical interests included trauma, gynecology, and plastic surgery. But it was in pediatric surgery that he had the most lasting impact, one that already had begun by the time he and his Boston colleagues trekked through cold and snow to Halifax to assist in the treatment of the hundreds of patients of all ages wounded in the explosion.

1. Intussusception

In 1908, Dr. James S. Stone at Boston Children's Hospital reported an operative mortality from intussusception of nearly 90% [1]. Results were no better at Boston's other two major facilities caring for infants and children, Infant's Hospital and the Massachusetts General Hospital (MGH) [1,2]. At MGH, Dr. Ernest A. Codman found one cause for the dismal results. Of the 27 patients of all ages with intussusception, including

* 2721 Banquos Trail, Pensacola, FL 32503. Tel.: +1 478 718 5401.
E-mail address: nakayama.don@gmail.com.

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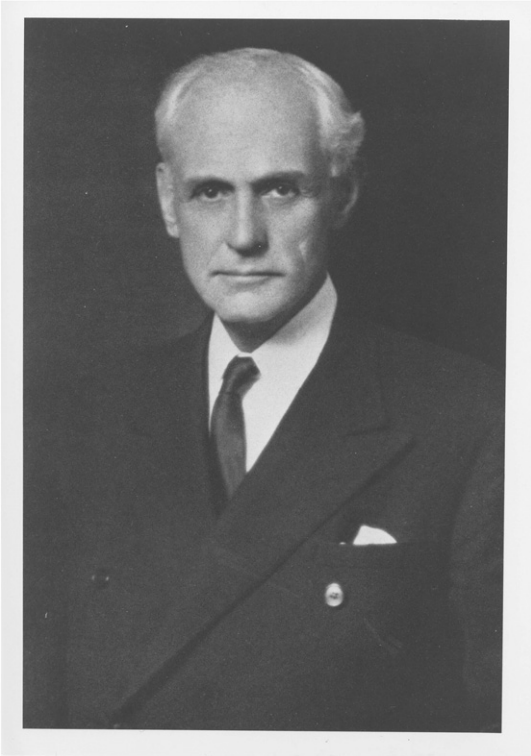

Fig. 1. William E. Ladd. Photo courtesy of Boston Children's Hospital Archives, Boston, Mass.

11 infants (10 of whom died), 15 different surgeons were involved, employing 14 different treatments. "The indications of each case must vary to a certain extent," he wrote, "but within certain limits, more uniformity of method might be reached [2]." Standardization of care would become one of the touchstones of today's emphasis on surgical quality, a direct descendant of Codman's pioneering work on outcomes-based surgical practice [3].

In contrast, the intussusception caseload at Boston Children's was shared by only two surgeons, Drs. Ladd and Stone. Their goal was to duplicate the success of Dr. Charles P.B. Clubbe of Sydney, Australia who documented in 1907 an operative mortality of 13% over the course of treating 124 cases from 1893 to 1906 [4]. They adopted Clubbe's principles: "Operate early and not after exhausting the patient by attempted palliation and delay, but as soon as the diagnosis is made;" keep the infant warm by wrapping the extremities and body with bandages; use a right paramedian incision and remove the intestine to expose the lesion; and reduce the intussusceptum by pushing it from below, much as one would empty a flexible rubber tube of air [5]. By 1913, Drs. Ladd and Stone had reduced the mortality to 45%, a 50% reduction compared with the results from Stone's previous article just five years earlier [6].

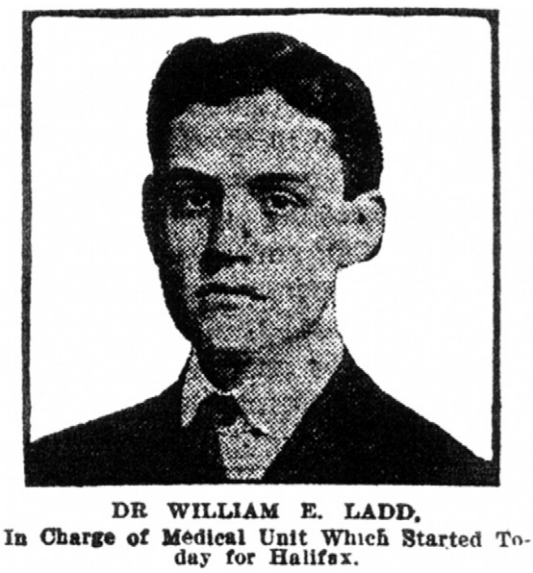

Fig. 2. Ladd at the time of the Halifax explosion relief expedition, December 8, 1917. Reprinted from ref. [13].

Ladd was the first to use a contrast enema in the diagnosis and therapy of intussusception. He used a bismuth slurry to outline the lesion on radiographic images in two patients and partially reduced it before surgery. In Ladd's view, attempts at complete reduction using the techniques available at the time were unduly hazardous and served only to delay surgery. In addition, the intussusceptum often reached the anus by the time the child was seen by a physician. His goal was to push it proximally to a point where it could be easily reached through the right paramedian incision he favored. In a third patient, he used the bismuth enema to prove that a child did not have intussusception and, thus, he avoided an unnecessary operation [6].

2. Pyloric stenosis

The reported operative mortality for pyloric stenosis was more than 60% as late as 1910, with the favored operations being gastroenterostomy and Heineke–Mikulicz pyloroplasty [7]. By 1914, American surgeons reported operative mortality rates of 14%–32% with gastroenterostomy [8]. In a simplification of Dr. Pierre Frédet's extramucosal longitudinal pyloromyotomy and transverse closure procedure described in 1907, Dr. Conrad Ramstedt in 1912 showed that leaving the longitudinal seromuscular incision open effectively relieved the pyloric obstruction [9]. Quick to adopt Ramstedt's technique, Dr. William Downes of New York did his first case only two years later. From 1914 to 1916, he had collected a series of 35 cases, with a mortality of 23%, no worse than that reported with gastroenterostomy [10].

Only a few months later in January 1915, Ladd performed the first extramucosal pyloromyotomy done at the Boston Children's Hospital. By 1918, he had a series of 26 cases and reported a mortality of 15% [11]. In his next paper on the topic in 1927, Ladd reported 29 consecutive cases without mortality. "The operation may be classed as one of the most gratifying in the field of surgery," he wrote [12].

3. The Halifax explosion and Ladd

A French munitions vessel and a Norwegian relief ship collided in the narrows of Halifax harbor on December 6, 1917, igniting a blast that leveled the city and left nearly 2000 dead and 9000 blinded and injured, among them many children. Among the Canadian and American relief operations was a group of 27 doctors, 68 nurses, and 8 orderlies from Boston, organized by Ladd and supported by the American Red Cross. With enough equipment to supply a 500-bed hospital, they battled through a blizzard to reach the frigid, stricken city just three days after the event, on December 9. Upon their arrival they set up a makeshift hospital in a damaged but still serviceable college building to provide surgical care to the hundreds that were transported or found their way to their facility. They stayed for nearly a month over the Christmas and New Year's holidays. To the present day, each Christmas season, Haligonians express their gratitude with the gift of a giant spruce to serve as the city of Boston's Christmas tree in Boston Commons [13].

4. The creation myth

As the story goes, so many children were injured that Ladd was moved to dedicate himself to pediatric surgery. Dr. Robert E. Gross