

The art of medicine

Why were surgical gloves not used earlier?

Many historical accounts show deep impatience with past surgeons' hesitation to adopt surgical gloves. It seems to be a puzzle that such an obviously beneficial technique could have been overlooked for such a long time, and that, once it was available, it was still not used consistently for many years. The standard example is the story of William Halsted at the Johns Hopkins Hospital in Baltimore, MD, USA, who had introduced surgical gloves in his operating room in 1889, but only for nurses, not for the operating surgeons.

As Halsted recalled in an article in 1913, the nurse in charge of his operating room suffered from dermatitis of her arms and hands caused by the solution of mercuric chloride used as an antiseptic. To keep this, as he wrote, "unusually efficient woman" in his operating room, Halsted "one day in New York requested the Goodyear Rubber Company to make as an experiment two pair of thin rubber gloves with gauntlets". The fact that this nurse was Halsted's later wife makes for a popular story in the anecdotes of medical history. However, the story also raises the question why it took 7 years until operating surgeons wore gloves on a routine basis too. Even Halsted himself wondered in retrospect how he could have been so "blind as not to have perceived the necessity for wearing them invariably at the operating table". A closer examination of this story will show that a look at alternative paths of innovation in the history of medicine can solve that puzzle.

Halsted's disinterest in gloves was not due to carelessness: the Johns Hopkins chief surgeon was known to be a paragon of fastidiousness when it came to preventing wound infection. Using Robert Koch's bacteriological techniques, Halsted tested Joseph Lister's system of antiseptics, and, like the German scientist before him, he found it to be impossible to eliminate all bacteria in the wound through the use of antiseptics as recommended by Lister. There had to be a better way to eliminate wound infection. The key seemed to lie in the condition of the patient's wound and tissue. A clean wound and healthy, well circulated tissues would prevent those bacteria that were inevitably present in the wound from actually causing an infection. In one animal experiment, for example, Halsted intentionally introduced bacteria into the peritoneal cavity of dogs and noticed that no harm occurred as long as he carefully avoided any mechanical injury to the tissues. If he, however, bruised the tissue or cut off some small part of it from its blood supply, "a single bacterium...was able to multiply and cause a fatal peritonitis", he reported. For Halsted, infection prophylaxis thus depended on using careful and gentle operating technique. Obstruction to the circulation produced by sutures and ligatures was "the immediate cause of suppuration in infected wounds", he thought. Therefore, he put his focus on operative technique—as his first biographer William MacCallum put it, Halsted's procedures were "of

mathematical precision, with healing almost as precisely ensured". Thus, much of Halsted's infection prophylaxis was embodied in his surgical technique rather than in preventing contamination. Gloves were not high on his agenda, especially since wearing them would make it more difficult, if anything, to pursue his thorough operating style.

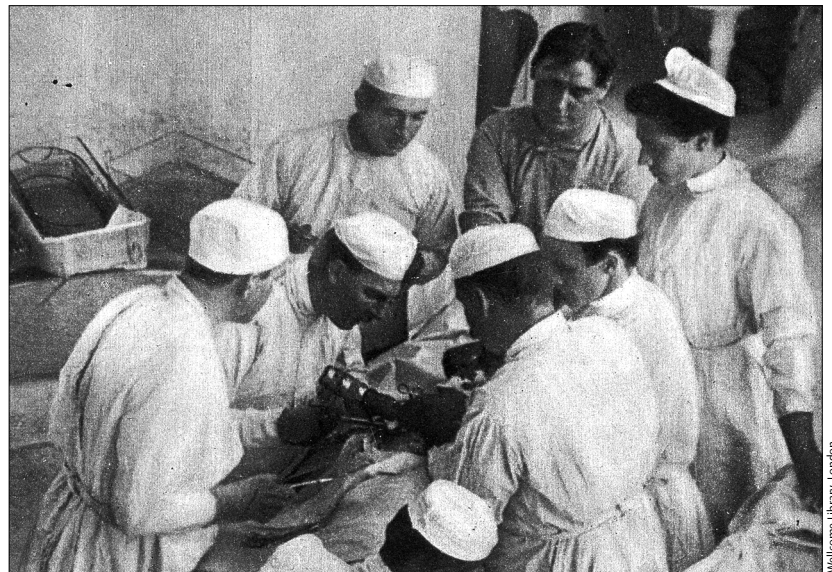
Halsted's careful operating technique was not the only alternative to the use of surgical gloves. Along the lines of contamination control, there existed, for example, many different procedures for hand disinfection. In 1888, Paul Fürbringer in Berlin reported on a standardised procedure in which he first washed his hands with soap, then alcohol, and finally an antiseptic substance. Supported by bacteriological laboratory studies, the procedure was adopted as the gold standard of hand disinfection in surgery. Another strategy involved keeping one's hands clean between operations and abstaining from handling infectious material, even when not on the job—an approach that in some cases amounted to a whole regime of living. In an article for the *Transactions of the American Surgical Association* in 1899, Theodor Kocher recommended not touching "any infective fluids or septic matters with our hands" and suggested surgeons "wear gloves before and between the time of our operations". Strict separation between patients, operating theatres, and surgeons represented another approach. Thus, when Gustav Neuber in Germany proposed what he called "asepsis" (he coined the term)—the avoidance of germs in the first place instead of killing them with an antiseptic substance—as an alternative to Lister's antiseptics, his strategy entailed the separation of septic and aseptic cases, rooms, and operators. In 1886, he published a book on how he had implemented this plan in his hospital. All of these various technologies of cleanliness and order reflect what one can call local cultures of wound disease prevention in the decades around 1900. Some of them included gloves, others didn't.

Some surgeons thought the best way of preventing contamination was to avoid any contact between the surgeon's hands and the wound and developed no-touch techniques for their operations. The British surgeon William Arbuthnot Lane designed a set of instruments sporting extra-long handles for operative fracture treatment in 1905. Still another strategy involved coating the surgeon's hands with a layer of some substance. This substance was supposed to keep hand-borne germs from contaminating the wound without compromising the operator's manual dexterity. For this purpose some surgeons tried paraffin. The German surgeon Carl Ludwig Schleich used a special wax paste as an aseptic "microscopic glove", "impermeable to water, blood juices, and bacteria", as he wrote in his *Neue Methoden der Wundheilung* of 1899. None of these methods were widely

adopted, mainly, it seems, because the coatings were not durable enough to last through a surgical intervention. The theme, however, persisted into the 20th century: in 1943 at the University of Chicago, Benjamin F Miller, Richard Abrams, Dorothy Ann Huber, and Morton Klein reported on their observation that “cationic detergents deposit an invisible, non-perceptible film on the hands which retains bacteria under it”, which was supposedly durable and had “bactericidal power”.

A very different approach to dealing with wound infection was systemic and took vaccination as its model. In the decades before World War 1, some surgeons tried to create specific immunity against wound infection or to boost the patient’s general immune defence before surgical operations. Johannes Mikulicz, for example, a leading German surgeon of the late 19th century, who, among other things, added the facemask to the surgical equipment, submitted his patients to a preoperative injection of nucleic acid which was supposed to increase their white blood cell count and strengthen their immune response. Such attempts were quite similar to antibiotic prophylaxis, as it was introduced a couple of decades later. So gloves represented by no means the only promising way to prevent wound infection. There were many alternatives around, and not going for gloves right away was quite rational for surgeons at the time.

A similar story can be told about the introduction of antisepsis into surgery a couple of years earlier. For a long time, the eventual acceptance of antisepsis after decades of controversy has been told as the history of progressive ideas overcoming conservative stubbornness. Surgeons who favoured Lister’s antisepsis right away, in the 1870s and 1880s, were seen as *avant-garde*. Those who didn’t were thought to be resistant to innovation. This story was teleological: it assumed that history inexorably advances towards a particular goal and that the adoption of antisepsis was the quasi-natural outcome of this history. But historians have shown that many surgeons were not particularly interested in Lister’s ideas and practices at the time—not because they were conservative or stubborn, but because they were busy developing their own innovations. As Michael Worboys states, “each surgeon had his own ideas and techniques”. They were finding other ways and strategies for the prevention of wound disease. There was, for example, a group of doctors, scientists, and administrators in Lister’s time who, as Worboys writes, “transferred the rhetoric and prescriptions of the sanitary movement from the urban environment...to urban hospitals and their patients”. For the proponents of sanitation, Lister’s focus on applying one chemical substance was a distraction from what really needed to be done, namely reforming the hospitals. But even at the more technical level, there were many alternatives to Lister’s antisepsis. One of the most influential was the so-called “cleanliness and cold water school”. Its protagonist, Thomas Spencer Wells, surgeon to Queen Victoria and President of the Royal College of Surgeons of England



William Halsted operating in the New Surgical Ampitheatre in 1904

who was often portrayed as stubbornly resisting Lister’s innovation, emphasised the role of general sanitary principles and scrupulous cleanliness and purity. Wells did thousands of invasive interventions, in particular ovariectomies, during the second half of the 19th century. According to his extensive documentation, his complication rate was minimal, even without using antisepsis. Wells is only one example. We can find a whole landscape of creative and rational innovations for controlling wound disease at the time; many of them were quite successful, even among those innovations which did not interpret wound complications as caused by infection through living germs. However, historiography lost sight of this diversity once Lister had been declared the founding figure of all of the different methods of avoiding wound infection in the late 19th century.

At closer examination such alternatives emerge wherever one looks in the history of medicine. If we take them seriously, we can better understand the choices made by historical actors. Whole worlds of alternative versions of modern medicine open up, comprising old or new technologies, surgical and non-surgical solutions to problems. It is worth examining these paths not taken to explore the many parallel roads, narrow trails, and dirt tracks, as well the main highways of medical history. Such explorations also put us in a better position to take notice of alternative forms of understanding and solving problems today, and to beware of what historian of technology David Edgerton has called “overblown claims of a one best way” of dealing with medical challenges.

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Further reading

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