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Surgical Knife

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The knife was the first tool to be developed. It is the most commonly used tool today. It is used in various professions; it is used in the manufacture of commodities; it is an essential part of many technologies; and it is used as an eating utensil.

Evidence of knives used in medicine goes back as far as the Mesolithic period (the Middle Stone Age)—around 8000 BC, when flint knives were used as scrapers to cut through the skull (Fig. 1).[1] It is presumed that the skull was penetrated to allow the escape of demons that caused headaches, melancholy, or epilepsy.

Hippocrates was the first to describe the surgical knife. He used the word macairion, derived from machaira, an old Lacedaemonian sword, which had a broad cutting blade on a single edge and a sharp, straight point (Fig. 2). Therefore, even in Hippocrates' time, the shape of the scalpel was much the same as it is today. Galen in his early writings used the word smilé to denote a scalpel. Born in Greek Asia Minor, he moved to Rome, where he did most of his writing. He translated the bellied scalpel that Hippocrates used in opening the empyema as "staythawadace," which literally means "shape of a breast," referring to a woman's breast.

The Romans used the Latin "scallpellus," from which the English "scalpel" is clearly derived. This was the golden age of surgery in Rome, when Celsus and Galen, as leaders of Roman surgery, followed the teaching of Hippocrates. The ancient Romans were extremely proficient in the art of making cutting instruments. Knives, spears, and lances of both bronze and iron have been found in the ruins of Pompeii (Fig. 3).

After the death of Galen and the other great surgeons of the 2nd century AD, there came a period of hundreds of years in which the art of medicine and surgery fell back under the sway of religious fanatics. During the Middle Ages, from 500 to 1000 AD, a period known as the Dark Ages, knowledge of surgery was lost and advances in surgical instruments halted. Religious beliefs and superstitions contributed to the stagnation of medical knowledge.

Indeed few advancements were made in surgery until the time of Guy de Chauliac in France in the middle of the 14th century and Ambroise Paré in the 15th century. Paré began as a barber surgeon and became a military surgeon, then a master surgeon, and finally surgeon to the court of Henry II, King of France. Paré is given credit for countless innovations in the art of surgery, and he improved and refined surgical instruments more than any other man. Surgical instruments that were developed during his time were real pieces of art (Fig. 4).

The history of surgical knives follows the history of cutlery. In ancient Rome, cutlery was practiced by armorers, upon whom surgeons had to rely to make their instruments. With the growth of the empire, the people who had been conquered by the Romans acquired skill in the fabrication of knives. During the Middle Ages, a number of cities, notably Toledo in Spain and Damascus in Syria, became famous for their cutlery products, especially swords. In England, Sheffield became a center of cutlery renowned for its excellence in knives.

There is no record of the making of surgical instruments as a profession until the 18th century. Even at that time, surgical instruments were just a small part of the business of cutlery houses in England, France, Holland, and Germany. Surgical instrument manufacturing in the United States was slow to develop. Despite the emergence of a domestic industry in this country in the early 1800s, most surgeons preferred foreign-made instruments, deeming them better in workmanship and design. Preference for foreign goods waned only when American firms demonstrated the capacity to produce instruments of equal quality. Evidence of that achievement came in the mid-1800s.

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The Civil War brought instrument-makers their most productive and profitable years. Government contracts amounted to over 5,000 general operating and amputation sets, which kept several firms busy for the duration of the war. Also, import tariffs and strained relations with foreign countries during the war decreased the competition. However, in the early 20th century, cheaper labor in Europe was able to recapture much of the instrument-making, and many American firms became only importers of foreign-made products. In Germany at this time, there was a shift in production techniques from hand to machine and a transfer of operations from shop to factory. The destruction in Europe from the 2 great wars enabled the American industry to assume leadership in the postwar era.

A surgical knife must meet certain requirements. The most important is sharpness. Other features are shape, rigidity, balance, uniformity, and dependability. It should not be heavy or clumsy, and the handle should be thin, as is consistent with a good grip. Seventy years ago, most scalpels were made of nickel- or chromium-plated carbon steel. Upon the discovery of better alloys and special methods of hardening high-alloyed steel, stainless steel took the place of the nickeled and chromed.

The development of the modern scalpel with disposable blade, as we know it today, was largely the result of Mr. King Gillette's invention of the safety razor (patented in 1904). In 1910, the eminent Dr. John B. Murphy of Chicago perfected special handles for both single- and double-edged razor blades, assuring the surgeon of ready access to a very sharp knife blade (Fig. 5).[1] Although Murphy's handles permitted the use of these blades, they were not satisfactory from a technical standpoint.

It was Morgan Parker who figured a way to put the blade and handle together without a 3rd part. In 1915, he received a patent on a new 2-piece scalpel, with blade and handle held together by overlapping metal parts (Fig. 6). His new 2-piece design provided rigidity and enabled the exchange of old blades for new after each use. Together with Charles Russell Bard, Parker formed the Bard-Parker Company and developed a method of cold sterilization that would not dull the blades, as did heat. In 1923, Parker bought out Bard's interest consequent to a disagreement over subcontracting manufacture of the scalpel. (Bard-Parker later became a division of Becton, Dickinson and Company.) The present design of the Rib-Back blade was introduced in 1936 (Fig. 7).[1] Before the development of the Bard-Parker blade, there were over 350 different kinds of scalpels.

The manner in which a surgeon handles a scalpel is as important as its manufacture. The scalpel should not be grabbed as a hammer, a racquet, or a writing pen, but should be held as a violinist holds a bow. It should be

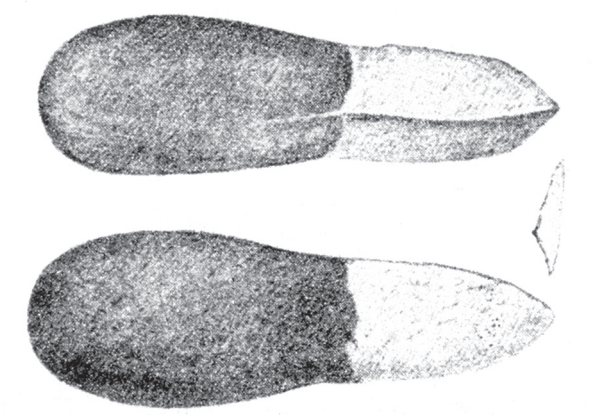

Fig. 1 *Flint knife, used to bore holes in skull. Reprinted by permission.*[1]

Fig. 2 *The etymology of the term "surgical knife" dates back to Hippocrates.*

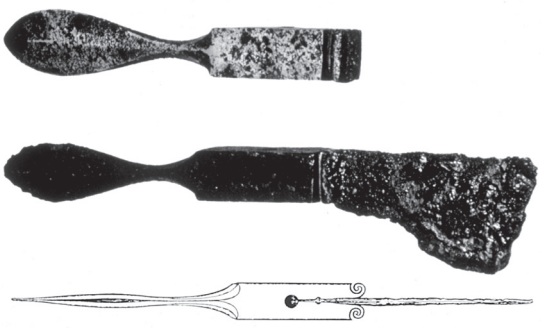

Fig. 3 *Bronze knives found in the destruction of Pompeii.*

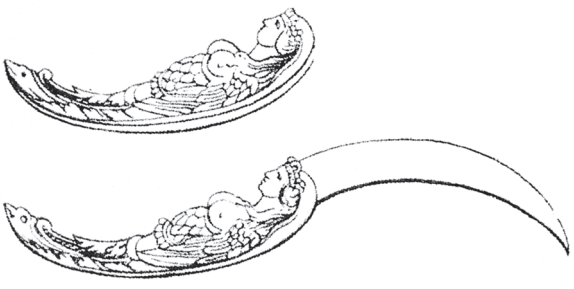

Fig. 4 *Knife made by Ambroise Paré.*

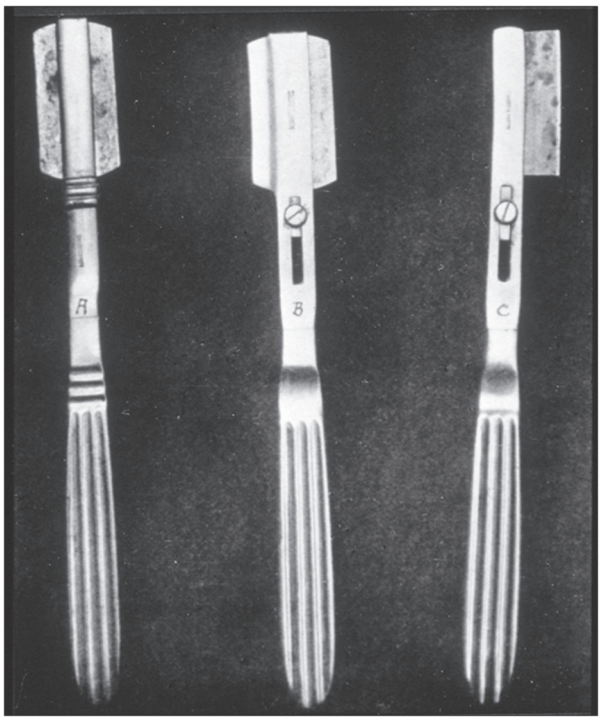

Fig. 5 *Dr. John B. Murphy's special razor-blade handles. Reprinted by permission.*[1]

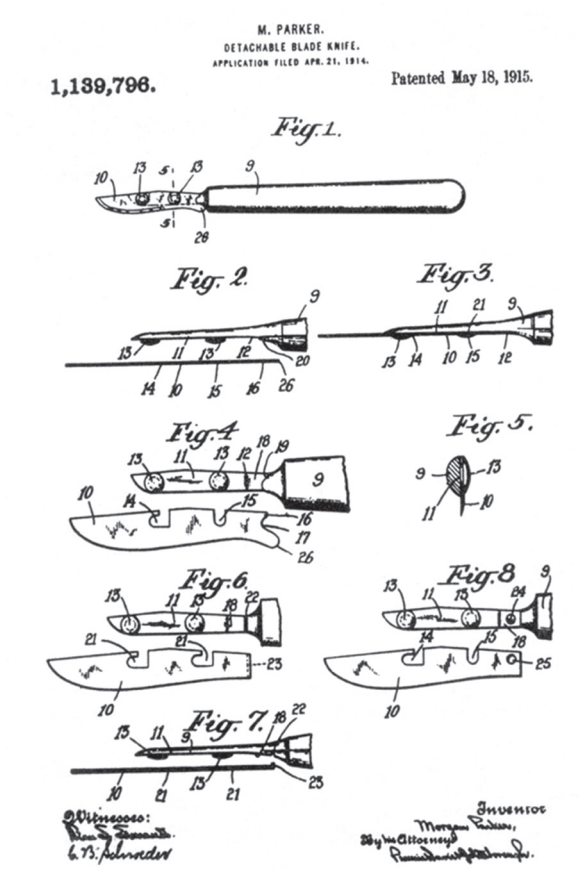

Fig. 6 *Morgan Parker's patent on the two-piece scalpel (1915).*

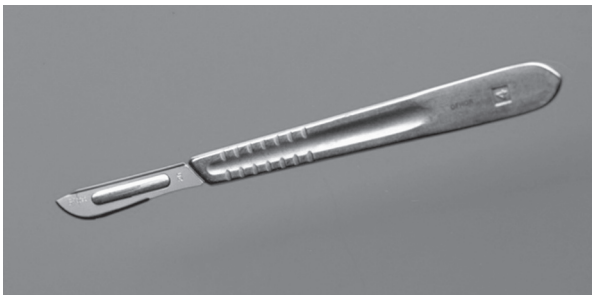

Fig. 7 *Bard-Parker "Rib-Back" scalpel. Reprinted by permission.*[1]

held lightly by the tips of one's fingers and used with a graceful motion.

The knife handle appears to be dormant, a faceless object; but once its face is attached, it springs to life and becomes a scalpel. The surgeon has embraced this term, scalpel, for the surgical knife. "Knife" connotes danger. A knife is a weapon associated with mutilation and death, whereas a scalpel implies security associated with healing. The knife can be used by anyone, but only a surgeon can use a scalpel. The scalpel is an essential part of the surgeon's actions, and it is an instrument that demands respect. When properly used, the scalpel can perform miracles. Its misuse can cause catastrophes.

References

1. Ochsner J. The surgical knife. Bull Am Coll Surg 1999;84(2): 27-37.