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ABSTRACT: The historical development of surgical sutures, ligatures, and staples is discussed. The use of the jaws of giant ants, especially in the suturing of bowel injuries, is documented.

INTRODUCTION

Man and especially physicians and surgeons have been genuinely very inventive when it comes to ways and means of preventing, diagnosing, and healing disease. In this occurrence, the number of the various kinds of instruments which have been devised by surgeons for the diagnosis and the operative treatment of disease, is legion. From the earliest metal instruments, to bees wax, to metal clips, optico-scopic devices used in endoscopic work, and most recently in laparoscopic surgery, passing by the electric cautery, the ultrasonic knife, and the lithotriptor, the variety of surgical modalities remains the trellis on which grows and thrives the ever advancing surgical instrumentation.

One of the several dimensions of the history of surgery relates to the development of suturing and ligature techniques. These include simple suture, the development of catgut, the use of silk, cotton thread, hair, cautery, and boiling oil, and more recently metallic suturing with silver, gold, tantalum, steel and other alloys, electric cautery, and finally the techniques of stapling. The most interesting chapter, however, is that in which the jaws of the giant ant are used in a protostapling technique.

HISTORICAL BACKGROUND

The use of fine gold wire in dentistry was probably invented and first practiced in Phoenicia. The first archeological evidence of the use of gold wire in dentistry was an example of gold-wired teeth in a mandible found in a Tyrean necropolis by Mr Ford ; and it has been referred to in the literature as the "Ford mandible". The jaw with its beautiful gold wiring of the teeth has been dated back to the 14th or 15th century BC [1], the jaw is now exhibited at the Museum of the American University of Beirut.

The all-important use of animal gut, as a ligature in surgical operations, seems to have been introduced by ābw bakr zakariyyA ālrAzÿ (d c 932) [2-4]. ābw ālqAsim álzahrAwý (d c 1013 AD) confirmed the use of animal gut for the ligation of arteries and emphasized the necessity of being careful not to ligate an adjacent nerve. He also introduced the use of gut in intestinal surgery [5]. Albücasis, as he was later known in Latin Europe, described the use of wire suture for fractured jaw and for loose teeth [6] ; he also developed the art of cauterization to a superlative degree and described and illustrated a large variety of cauteries, many of which he devised himself [6]. In the choice of suture material, Albücasis is also very versatile. He recommended the use of wool for surgical procedures on the eyelid, such as entropion, the use of silk in the ligature of the temporal artery, horse or ox hair for the operation of pterygium, and wire, silver or gold, for the wiring of loose teeth or artificial teeth [7].

When I was practicing surgery in riyAD, Saudi Arabia (1977-81) [8], I saw an elderly black patient on 1977 05 24 ; he wanted something removed from his leg. But nothing could be seen on his leg until it was thoroughly washed, and a 1/4 inch layer of dirt was washed and scraped off ; only then a 12 cm long sutured incision was seen and the man ordered me to remove the sutures. The suture material was thick hemp thread or flax twines (khayT maSSÿS) that he had used himself on a mattress needle (msalle) about 22 days earlier. It is amazing how dexterous our patient, and his like, are and how stoic to have stitched his own leg wound himself with thick thread and a huge needle, without any anesthesia or sedation !

Whether man learned the technique of suturing wounds with the jaws of ants from ants themselves or devised it independently, will probably never be known. For it had been recorded that a species of ants Ecophylla smaragdina use their jaws to suture green leaves for their nests [Baroni-Urbani, 9 : pp 14, 307-8] ; they use their own larva as shuttles to weave their own fine silk performing a
The use of the jaws of ants to suture wounds has been sporadically reported from several countries, as early as the 10th century BC [11-13, 19] and as late as 1984, a range of nearly 3000 years.

The earliest mention of ants used in surgery occurs in the Samhita: “Black ants should be applied to the perforated intestines … and their bodies should be separated from their heads after they had firmly bitten the perforated parts with their jaws. After that the intestines with the heads of the ants attached to them should be gently pushed back into the cavity” [12, 9 p 304].

Arabic medical literature contains a description of this technique in āltaSrÿj liman ‘ajiza ‘an ālta’ýf written in the 11th century AD by the famous Arab surgeon, ālżahrAwÿ [Abulcasis or Albucasis, 5-6, 14] (Fig 1). He wrote: “It has been said by people of experience that when the intestine is wounded and the wound is small, one ought to use the following suture technique: ants with large heads are used; the lips of the wound are approximated; one of the ants, with its jaws open, is applied over the lips of the wound; when it grasps and firmly closes its jaws, its head is cut off; it will then hold and will not loosen its grip; another ant is then applied next to the first one; this process is continued with one ant after the other over the whole extent of the wound … the jaws will remain holding the intestines until they stick and heal. The patient suffers no complication.”

Between 1352 and 1569 the use of ants was mentioned, at least, four times in Latin medical texts [14], but one cannot tell whether the authors really tried them or just repeated what they had read in Albucasis [9, p 519].

Fallopio [14] (of Fallopian tubes fame) himself was the author of one of these reports (1569 AD). This very curious technique was found so neat and so interesting that it was reported, in 1844, to the “Société entomologique de la France” and, in 1845, it was communicated to Malgaigne, editor of the Journal de Chirurgie [14].

In 1845, Furnari [15] reported that he had seen in Algeria, wounds clamped with the jaws of the beetle Scarites pyramon [9, p 308]. Beebe reported in 1921 [16] that Guiana Indians suture wounds with the jaws of giant Atta cephalotes. He found the jaws of two Attas clamped onto his own boots, “with a mechanical vise-like grip, wholly independent of life or death [9, p 304].

In November 2004, my polymath brother Ibrahim alerted me to the reference from Bernard’s book [17] that said: “Henry de Monfreid … trafiquant et écrivain; connut la Somalie mieux que personne … Or, dans un de ses livres … les sorciers … savent coudre une plaie à l’aide, non d’instruments, mais d’insectes … ils emploient une variété particulière de fourmi, les prennent en main une à
une, de façon que les pinces de l’insecte saisissent chacune des lèvres de la plaie, puis, à l’aide du doigt, ils décapitent la fourmi.”

The report of the use of the jaws of giant ants for suturing surgical wounds (Fig. 2) has emanated from many different parts of the world (Asia, Europe, Africa, South America) including: India, Spain, Italy, Brazil, Turkey, Algeria, Guiana, Congo, and Somalia, and by many different historians and surgeons (Table I).

For obvious reasons, the use of ants in surgery does not seem to have spread much, nor has it become general. Whitaker [23] identified the giant ant used as a suture as the army ant of the subfamily Aenictinae; it can be identified by the lack of compound eyes, the 10-segmented antennae, the mesosoma being attached to the gaster by two distinct segments, the petiole and postpetiole and the lack of frontal lobes which makes the antennal sockets completely visible when viewed from the front … they range from 4 to 25 mm … their strength lies in their powerful jaws … once the jaws are clamped they are practically impossible to pry open.”

Writing about the subject of the use of ants in surgery, Majno, in his wonderful book [9, p 306], consulted many entomologists including TC Scheirila* and NA Weber**, then experimented with several species of ants to find out if they could be used in surgery. Several were found to be useless: the jaws of Atta ants, for example, were found to be too small to have any practical value [9, p 306].

However, he obtained beautiful and excellent results with other ant species, namely: • Eciton burchellii and Eciton hamatus [9, pp 306-9 and Pt 7.2 between p 286 and p 287] from South America, and • Dorylus [9, pp 306-8] from Africa and Asia.

**TABLE I**

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<th>STAPLING WITH THE JAWS OF GIANT ANTS [9]</th>
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* who wrote: “It is a real problem to get the jaws of these insects out of your skin once they have been firmly implanted” [9, p 306].

** was personally bitten by an ant so effectively that his clothes had become sutured to his skin.

REFERENCES

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