

SPECIAL ARTICLE

# Paulus Aegineta: The Pioneer of Plastic Surgery Evolution and Comparisons

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## ABSTRACT

Paulus Aegineta was one of the major representatives of surgery in the Byzantine period. His works had a great influence on Islamic and Western medicine, conveying significant practices, including "plastic" surgery, to the subsequent ages. In the present paper we compared Paulus Aegineta's surgical techniques with their respective operations described in Surgical Manuals of the 19<sup>th</sup> century or thereafter. His methods in surgery remained virtually fadeless for a very long period of time. From the comparisons made we traced many similarities, which lead to the conclusion that for over 1200 years the evolution of this field of surgery, today called "plastic surgery", was rather minor. The great evolution of plastic surgery emerged in the second half of the 20<sup>th</sup> century and particularly the last 20 years, concurrently with the amazing technological progress. We conclude that plastic and reconstructive surgery remained unchanged for many centuries in a neonatal stage. It is probably the technological evolution of the 20<sup>th</sup> century that changed the rate of development of plastic surgery in our era, converting it to a completely discrete, high-tech specialty, as is today.

## INTRODUCTION

With the destruction of the Western Roman Empire and the surrender of Rome to the invading hordes from the North in the fifth century A.D., the medical teachings of the great masters of the past were preserved for posterity in the East by a series of Byzantine doctors. The Byzantine era can be divided in Early (4<sup>th</sup> to 7<sup>th</sup> c. A.D.), Middle (8<sup>th</sup> to 12<sup>th</sup> c. A.D.) and Late (13<sup>th</sup> to 15<sup>th</sup> c. A.D.). During the Early Byzantine period, the most prominent physicians were Oribasius (325–405 A.D.), Aetius of Amida (502–575 A.D.), Moschion (6<sup>th</sup> century), and Paulus Aegineta (625–690 A.D.) [1].

Paulus was born on the island of Aegina (Southern Greece) and practiced medicine in Alexandria (Fig. 1). He was the author of the *Epitome of Medicine* (seven books), published in Greek by Aldine press in Venice, in 1528 (Fig. 2) [2]. Although Paulus admitted to being only a humble scribe of the work of his predecessors, he was, in fact, a competent surgeon. He described many surgical procedures varying from the treatment of nasal and jaw fractures to operations for gynecomastia, excision of a ganglion, and hermaphroditism [3]. Although these operations cannot be termed "plastic" with the modern sense of the term, they certainly did have a strong cosmetic influence. Hence,



FIGURE 1. Likeness of old Paulus Aegineta (from the frontispiece of a collection of Galen's works published in Venice, 1565).

Paulus Aegineta should be considered a pioneer in performing some early operations in the field of plastic surgery.

The aim of our study is to present Paulus Aegineta's contributions to this field and to highlight the similarity of these procedures with the ones performed in Western Europe about 1200 years later. It is impressive to say that Paulus' books on surgery were the official manuals of Surgery taught in the Sorbonne University from 1607 to 1799. Thus, the late evolution of plastic surgery is documented.

Our material was extracts from chapters of his 6<sup>th</sup> (Fig. 3), 3<sup>rd</sup> and 4<sup>th</sup> books of the *Epitome* as well as extracts from Medical books dated before 1900 housed in the "Old Medical Books' Library" in "St. Andrew's" General State Hospital, Patras, Greece. Comparisons were made between some of Paulus Aegineta's surgical procedures and the correspondent operations performed in the late 19th century and thereafter.

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PAULUS AEGINETA'S "PLASTIC"  
SURGERY

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Paulus Aegineta described procedures of correcting the excessive wrinkling of the scrotum. He writes that "the



FIGURE 2. Photograph showing the title page of the original copy of the first edition of Aegineta's *Epitome*, published by Aldine Press in Venice in 1528 (Special Collections, The Charles E. Young Research Library, University of California Los Angeles).

*loosening of the skin of the scrotum, when not accompanied by loosening of the internal organs (testicles) is a very ugly condition*". He describes two techniques for its reconstruction. The first was also reported by the ancient physician Leonides (1<sup>st</sup> c. AD), an eminent surgeon of the School of Alexandria while the second was reported by the famous surgeon Antyllus (2<sup>nd</sup> c. AD): "Leonides, placed the patient on a supine position, placing a small board or a piece of hard leather under the scrotum for support; the excess skin was removed and the lips (margins) of the wound were joined together with stitches; while Antyllus at first performed the application of three to four sutures through the skin of the scrotum before the removal of the excess skin with slant scissors or a knife. The sutures were then tightened and haemostatic cataplasms were applied on the wound" [4].

There is little difference between Paulus Aegineta's operation on wrinkling of the scrotum and the one described in Maximilian Chelius's "Handbuch der Chirurgie" published in

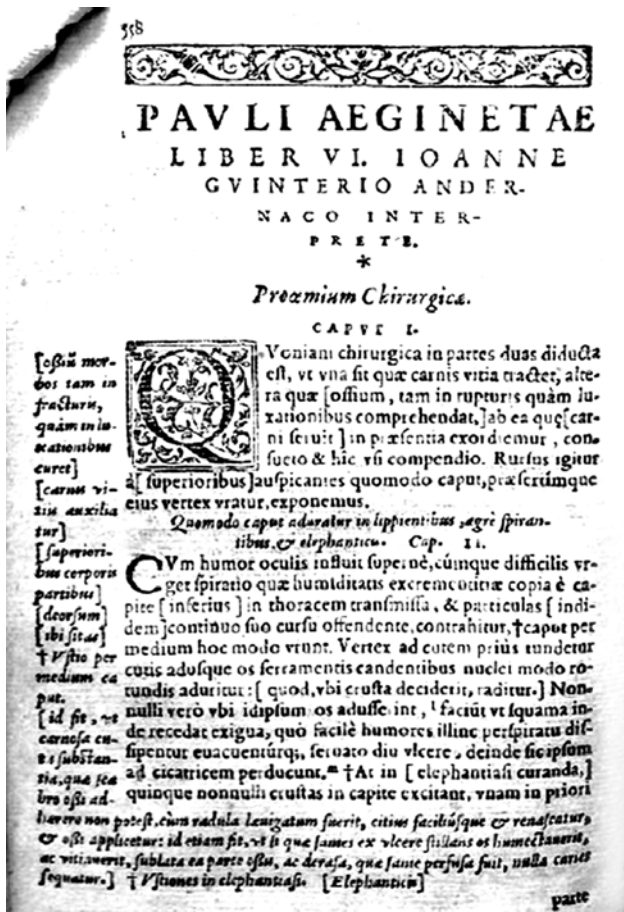


FIGURE 3. The front page of the sixth book on surgery (reproduced from the Latin translation printed in 1567).

1851: "... We perform two incisions starting from the base of the penis cutting down and outwards and then inwards until they meet under the testicles. And all the in-between tissues are removed taking care not to damage the testicles. The vessels are then ligated and the edges are stitched together." [5]

As for operations on hermaphrodites, Paulus writes: "In the condition known as hermaphroditism, the terminology of which originates from the names of Hermes (Mercury) and Aphrodite (Venus) and constitutes a shame for both sexes, there were according to the ancient physician Leonides, four types. Three of them occur in the male and one in the female sex. When occurring in males, there is a formation resembling the female genital organ with pubic hair, in some cases on the perineum while in some cases in the middle of the scrotum. Except for the above two types, there is a third, in which in the region of the scrotum there is again a formation like a vulva, from where urine escapes. In the female type, in the pubes above the vulva there is an outgrowth of male genital organs, that is, three protruding formations; one of them resembling the penis, while the other two are exactly like testicles. The

third male type, where urine escapes through the scrotum, is incurable. The other three are curable by removing the useless formations, while the remaining wounds are treated like ulcers" [6].

In his sixth book Paulus also describes the ablation of the overgrown clitoris: "In certain women the nymphæ (clitoris) is excessively large and presents shameful deformity, insomuch that, as it is reported, some women have had erections of this part like men, and also venereal desires of a like kind. So, with the woman lying in the supine position seizing the redundant portion of the nymphæ in forceps we cut it out with a scalpel, taking care not to cut too deeply" [7]. A similar operation is described in Maximilian Chelius's "Handbuch der Chirurgie" (1851): "... The surgeon after pulling down the clitoris with his fingers or with forceps cuts the redundant portion with a scalpel or scissors" [8]. Clitorectomy was anyway a usual procedure in Ancient Egypt before Paulus age.

In the section "On ganglion", Paulus Aegineta describes procedures for the treatment of ganglia: "Ganglion is a swelling of a tendon produced by an injury or weariness and occurs especially in those parts of the body that are frequently bent, like hands and feet... We operate upon them by dividing the skin with a scalpel, and if the tumors are small, seizing them with flesh [soft tissue] forceps and cutting them out by the roots... For larger ganglions, we bind a thick plate of lead, like vertebrae, larger than the ganglion itself. The weight of the lead will dissolve the ganglion over time" [9]. Ganglia dissolution with compression methods are also described by Dr Fano in "Traite Elementaire de Chirurgie" (1869) as well as in Dr Moynac's "Manuel de pathologie et de clinique medicales" (translated in Greek in 1887) [10,11]. "...After placing the limb that bears the ganglion on a stable surface we can squash it using our thumb in order to break the theca's wall and allow the liquid content to spread in the surrounding tissues where it will be finally absorbed" [10].

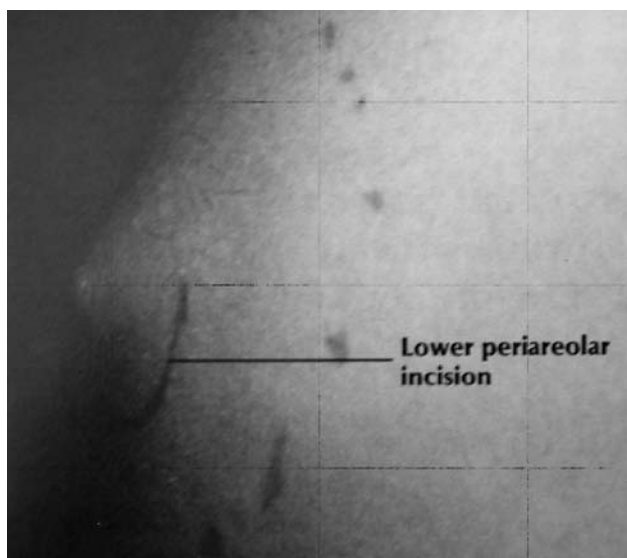
Paulus was well aware of the importance of his surgical procedures not only for therapeutical but also for social and cosmetic reasons. The following passage is an extract from his writings on gynecomastia: "At puberty, the breasts of a boy-like those of a girl - can swell to a certain extent, but for the most part, they will subside again. In some cases, when the swelling starts, it increases together with fat. As this deformity has the reproach of effeminacy, it is proper to operate upon it. Having, therefore, made a lunated incision below the breast, dissected away the skin and removed the fat, we unite the parts with sutures. If the breast inclines downward, owing perhaps to its magnitude, we make in it two lunated incisions, meeting together at the extremities, so that the smaller may be comprehended by the larger, dissecting away the intermediate skin, removing the fat, we use sutures in like manner. If, by accident, we dissect less than required, we dissect again the remaining part, stitch it and apply haemostatic cataplasms on the wound" [12]. A similar lunated incision is nowadays performed in the treatment of some grades of

gynecomastia (Fig. 4) [13].

Paulus described procedures for the treatment of nasal fractures and of ruptures of the mandible, the nose and the ear. Regarding nasal fractures and ruptures Paulus points out: *“The lower part of the nose being cartilaginous does not admit of fracture, but it is liable to be crushed, flattened, and distorted; but the upper part being of a bony substance is sometimes fractured.... When, therefore, the nose is fractured in its lower parts, having introduced the index or little finger into the nostril, push the parts outwards to their proper position. When the fracture is of the inner parts this is to be done with the head of a probe immediately, during the course of the first day, or not long afterwards, because the bones of the nose heal around the tenth day. But they are to be put into the proper position with the index-finger and thumb externally. In order to prevent the bones from changing their position, two wedge-like tents, formed of a twisted rag, are to be applied, one to each nostril, even if only one part of the nose is distorted, and these are to be allowed to remain until the bone or cartilage consolidates....”*[14]

In Dr Fano’s *“Traite Elementaire de Chirurgie”* [15] as well as in Dr Moynac’s *“Manuel de pathologie et de clinique mudicales”* [16] the operation presented is quite similar: *“...We insert into the nostril a catheter or forceps for women [i.e. small size] and with the other hand’s fingers we properly reset the bones”*.

Paulus continues: *“...If the nose becomes inflamed we may use some anti-inflammatory application to it, such as that made from plant-broths, the one from vinegar and oil, and such like; or a cataplasm of fine wheaten flour boiled with manna or gum may be applied, both for the sake of the inflammation and in order to keep the nose in position. When the nose is distorted to*



**FIGURE 4.** Lower periareolar incision performed nowadays in the surgical treatment of gynecomastia.

*either side, Hippocrates directs us, after it has been restored to its proper position, to take a piece of leather of a finger’s breadth, and having spread one of its ends with taurocolla (glue from a bull’s skin) or gum, to fasten one extremity on that side of the nose to which it inclines, and after it dries to bring the thong by the opposite ear to the occiput and forehead, and to fix the other end of the thong firmly there, so that the nose being drawn sideways may take the proper position in the middle. This practice, however, is not much approved of by contemporary doctors. If the bones of the nose are broken into small pieces we must make an incision or enlarge the wound, and having removed the small bones with hair forceps, unite the divided parts with sutures, and use the applications for recent wounds and those of an agglutinative nature”*[17].

Regarding the treatment of ear ruptures, Paulus Aegineta reports: *“Hippocrates suggests no intervention; but, since it is a painful condition, we use the following: smear equal quantities of moray, aloe, incense, acacia with vinegar or egg white, or smear pounded warm bread crumb with honey. Another treatment is to smear equal quantities of tar, incense, aloe, snail flesh, and hemlock tubers with vinegar, melt them together and make a cataplasm. If an inflammation occurs, smear with ground sesame or boiled oatmeal (groats) with vinegar. The cataplasms should be light, without bandaging or loosely bandaged, and put cotton soaked in oil in the duct of the ear”* [18].

As for the ruptures of the mandible, Paulus writes: *“The mandible is ruptured for many reasons. If a mandible which is broken only from the outside but not separated is hollow inside, which is easy to detect, if the right mandible is broken we use the right hand, and if the left mandible, the left hand, pushing downwards the index and middle finger in the patient’s mouth to move appropriately the inner curve of the rupture outwards so that it meets the other hand outside. We must keep in mind the correct positioning of the mandible and the straightness of the teeth on it. When the rupture is separating, first use the stretch and counteraction with an assistant holding it, and then, as it is said, straighten it. The teeth that have come apart on the ruptured part of the mandible are - as Hippocrates states - to be connected with golden, i.e. with what is called golden thread, and since this is not easy to find, with linen or cotton or horse hairs or something like [19].*

*But if the lesion is accompanied by an ulcer, which is verified using the probe, there is never a bone detachment. And if that happens, and the divergence is not extended, after cutting the ruptured bonelet, we stitch the ulcer’s edges with an appropriate instrument and we bind it, after applying haemostatic cataplasms on the wound. If it is without an ulcer, after putting a simple patch on the mandible, we bind appropriately. The middle of the bandage should be put on the occiput and the bindings on both sides from the ears to the tip of the jaw, then again on the jaw, then on the chin and from there via the cheeks on the sinciput and from there under the occiput, where the bandage must end. On these another bandage should be put around the*

forehead and attached at the back of the head so as to tighten all the abovementioned bandages. Some bind the mandible with a light small splint, whereas others use a piece of leather, as is said. Others use the so called “forbia” bandage” (a leather peristome which flute-players used to regulate the sound of the flute) [20].

Paulus Aegineta’s description on the performance of bandages on the fractured mandible is identical to the one in the French book “Traite Elementaire de Chirurgie” written by Dr Fano over a thousand years later (1869) (Fig. 5), as well as in Moynac’s “Manuel de pathologie et de clinique medicales” [21,22].

On ruptures of both mandibles Paulus writes: “If both mandibles are detached at the beard edge where their symphysis is, after taking them a little apart with both hands, connect them again and, after joining the teeth, as is said, bind them. And after using the appropriate bandage, advice (the patient) to rest and eat light and liquid food, since chewing should be avoided. And if the shape seems to be deformed, unbind, even for a third time, and correct again the bandage doing so until it heals. The mandible’s porosis is achieved in most cases in three weeks, when it is spongy and full of marrow. And if there is an infection, we must not neglect to change the suspensor and cataplasms. This

is what you have to keep in mind for all the above” [23].

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## DISCUSSION

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Although Paulus adopted many of the surgical methods of his predecessors, especially Oribasius and Aetius, he also introduced the results of his own observations and experience. Paulus described many surgical procedures that nowadays would be termed “plastic”, being himself aware of their importance for social and cosmetic reasons. In the present paper his achievements in this branch of surgery have been reported. Some of these surgical procedures seem to be original, as they were not described by other physicians before him.

In the present paper we performed comparisons of Paulus Aegineta’s methods to respective operations described in Surgery Manual’s of the 19<sup>th</sup> century or thereafter. From these comparisons it is obvious that for over 1200 years the evolution of this field of surgery, later named “plastic surgery”, was inconsiderable. The great evolution of plastic surgery emerged in the second half of the 20<sup>th</sup> century and particularly the last 20 years due to the amazing technological progress. This progress gave the plastic surgeons the potential to perform operations that they would never be able to accomplish before (i.e. microsurgical operations, laser-based applications etc).

Paulus Aegineta was one of the major representatives of surgery in the Byzantine period. His works had a great influence on Islamic and Western Surgery, conveying significant practices, including “plastic” surgery, to the subsequent ages. Despite the fact that other scholars and physicians contributed vastly to the field of surgery before him [24-26], Paulus stands above previous scholars because, in comparison to them, he included the entire spectrum of operations and all operations that had a “plastic” nuance. Even if other scholars before him had hypothetically written more on plastic operations in “lost works”, we have to make our conclusions with what we have in hand.

His methods in surgery remained virtually fadeless for a very long period of time. We conclude that plastic and reconstructive surgery remained unchanged for many centuries in a neonatal stage. It is probably the technological evolution of the 20<sup>th</sup> century that changed the rate of development of plastic surgery in our era, converting it to a completely discrete, high-tech specialty, as is today.

Most of Paulus Aegineta’s texts were translated from ancient Greek to modern English by the authors.

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FIGURE 5. Bandages’ application on the fractured mandible (reproduced from Dr Fano’s “Traite Elementaire de Chirurgie” published in 1869).

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