The Sebaceous Gland Through the Centuries: A Difficult Path to Independence

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Contents

Core Messages

- The existence of cutaneous orifices has been observed since ancient times.
- Marcello Malpighi (1628–1694) should be considered the true discoverer of the skin glands.

1.1 The Discovery of the Cutaneous Glands

From the Classical Age to date, a lot of progress has been made in Medicine, but skin diseases only reached their autonomy during the eighteenth century. Before this period, cutaneous disorders were only considered as "*materia peccans*," that means a sign of an internal disequilibrium of "humors," which need to be evacuated. Cutaneous pores were seen just as the way by which the body could purify itself.

As a matter of fact, the existence of cutaneous orifices has been observed since ancient times. In the early medical literature, they are usually called "pores." It was also known that the skin had some production of water (sweat) and fat (sebum), but the concept of specific glands was not clear until seventeenth century.

Indeed, the fine anatomy of the skin was not the interest of the early dermatologists as it can be observed in the first books devoted to skin diseases, such as those written by Gerolamo Mercuriale (1530–1606), who wrote the first

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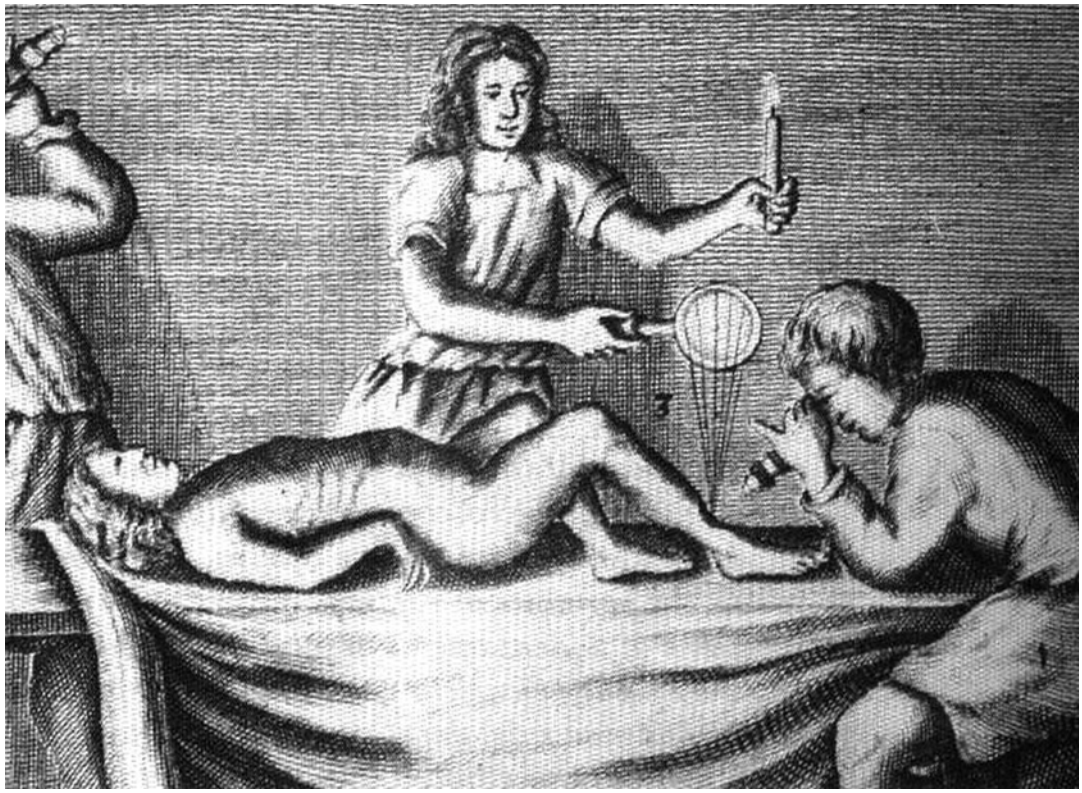

Fig. 1.1 An old illustration showing one of the first uses of the microscope on the human skin (from: "Opuscula omnia actis omnium eruditorum Lipsiensibus inserta, Venetiis, 1740")

dermatological book ever [1] by Anne-Charles Lorry (1726–1783) who wrote the first French dermatological book [2] or by Joseph Jacob von Plenck (1735–1807), who was the first to classify skin diseases with a rational method. For instance, in his book of dermatology written in 1776, sebum comes on the surface of the skin directly from the hypodermis [3].[1]

To be honest, the discovery of the anatomy and physiology of the skin was the result of the efforts of many anatomists especially from Italian and Dutch school. A powerful input came from the invention of the microscope. The first useful microscope was developed in the Netherlands in the early 1600s or even a few years before. Three different eyeglass makers have been given credit for the invention: Hans Lippershey (1570–1619), Hans Janssen, and his son, Zacharias (1585–1632). The coining of the name "microscope" has been credited to Johann Faber (1574–1629), who gave that name to Galileo Galilei's (1564–1642) instrument in 1625. At this time the magnification was only X3 to X9.

From this period on, the technical improvement of the microscope allowed a more refined anatomy (Fig. 1.1). Indeed, Marcello Malpighi

[1] Cutis Unctuosa

Est cutis splendor unctuosus ac si esset butyro illita.

Causa proxima est pororum glandularium, vel qui ad tunicam adiposam pergunt, laxa amplitudo, quae oleum subcutaneum transudare sinit.

1. Unctuositas vulgaris, curatur roborantibus internis, & externa applicatione aquae frigidae & liquoris adstringentis.

2. Unctuosistas elephantina, quae in elephantiasi observatur, est incurabilis ut elephantiasis

Translation from latin
Oily skin

The skin is shining as it as been treated with butter.

The proximal cause is due to follicular glands communicating with hypodermis, which let the subcutaneous oil appear on the surface because their loose opening.

1. Common oily skin is treated with internal remedies and external applications of cold water and astringent lotion.

2. Elephantine oily skin, as it is observed in elephantiasis, cannot be cured as the underlying disease"

Fig. 1.2 A classical image of Malpighi in an old print. The text says: "Marcellus Malpighius Medicus Bononenesis Mortuus 29 Novemb. Anno Dom. 1694"

Fig. 1.3 Giovanni Battista Morgagni represented when he was teaching in Padua. The text says: "Joannes Baptista Morgagnus natuis Forolivii die 25 Februarii anno 1682 in Patavino gymnasio e primaria sede Anatomen ad huc docebat anno 1769"

(1628–1694) (Fig. 1.2) [4] and then Giovanni Battista Morgagni (1682–1771) (Fig. 1.3) [5] in Italy have described the existence of glands inside the skin. Malpighi should be considered the true discoverer of the skin glands that have been described in his *Opera Postuma* (Fig. 1.4) including his famous *Epistola*. The opinion of Malpighi was accepted and adopted by the famous physician Hermann Boerhaave (1668–1738) (Fig. 1.5) who, at that time, was professor of Medicine and Botanics at the University of Leiden in the Netherlands.

In a letter written to the great anatomist Friederick Ruysch (1638–1731) (Fig. 1.6) who sent to him an anatomical specimen prepared from a child's cadaver, Boerhaave stated that:"… *after a long and careful observation, with the help of a powerful microscope, I am of the idea that those papules are indeed the follicles of the most simple skin glands.*" In Boerhaave's opinion, the skin glands are small bags ("*utriculi*") and not clusters of small vessels as Ruysch thought after his experiments with the injections of vessels with colored wax. Boerhaave continues his letter stating that Malpighi's opinion was the correct one when he stated that these glands are everywhere even though they are very small.

In the following lines, he continues the description found in the *Opera postuma* of Malpighi, in which the anatomist describes both the simple and composed *("conglobate")* glands. *"But, to help you to imagine with a better clarity, let me present to you this figure that is described in Malpighi's "Opera Postuma". In this (Figure 1.1-ure)* ***a,a,a,a*** *indicate the follicles of the simplest glands;* ***b,b,b,b*** *the single emissary vessels, coming from each gland ("otricina"); these (vessels) take in the common excretory canal;* ***d,c*** *their humors that finally are expelled through the opening* ***c*** *of the canal"* (Fig. 1.7).

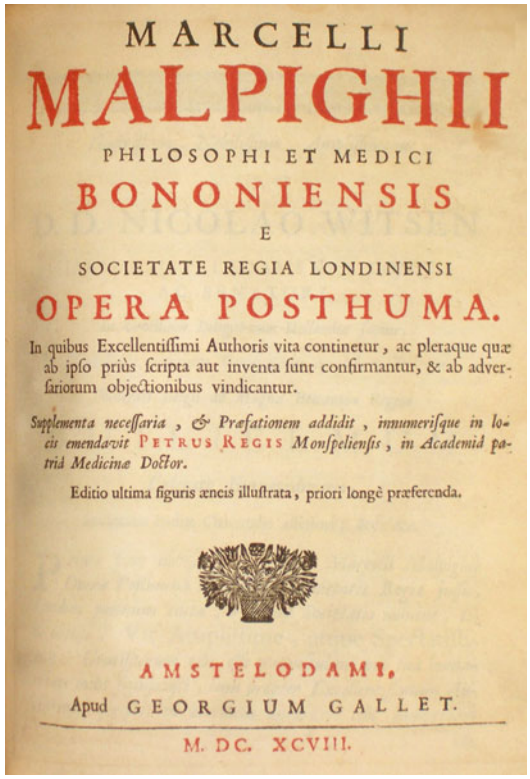
MARCELLI
MALPIGHII
PHILOSOPHI ET MEDICI
BONONIENSIS
E
SOCIETATE REGIA LONDINENSI
OPERA POSTHUMA.
In quibus Excellentiſſimi Authoris vita continetur, ac pleraque quæ ab ipſo priùs ſcripta aut inventa ſunt confirmantur, & ab adverſariorum objectionibus vindicantur.
Supplementa neceſſaria, & Præfationem addidit, innumeriſque in locis emendavit PETRUS REGIS Monſpelienſis, in Academiâ patriâ Medicinæ Doctor.
Editio ultima figuris æneis illuſtrata, priori longè præferenda.
AMSTELODAMI,
Apud GEORGIUM GALLET.
M. DC. XCVIII.

Fig. 1.4 The first page of Malpighi's Opera Postuma published in Amsterdam in 1698

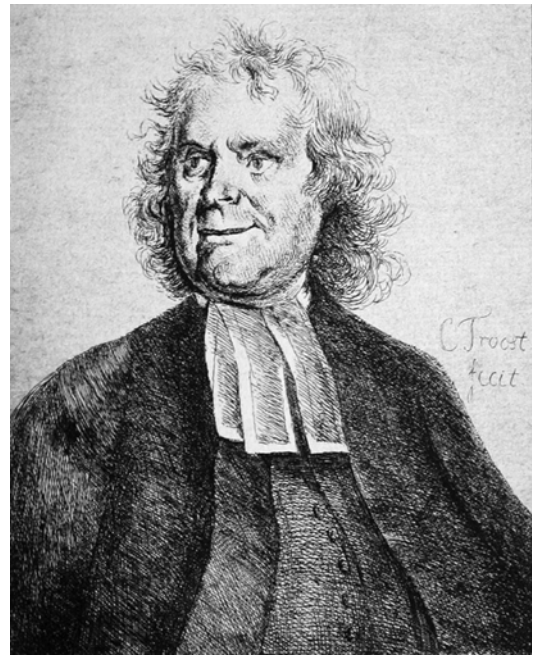

Fig. 1.5 An image of Hermann Boerhaave, professor of Medicine and Botanics at the University of Leiden in the Netherlands and partisan of Malpighi's ideas

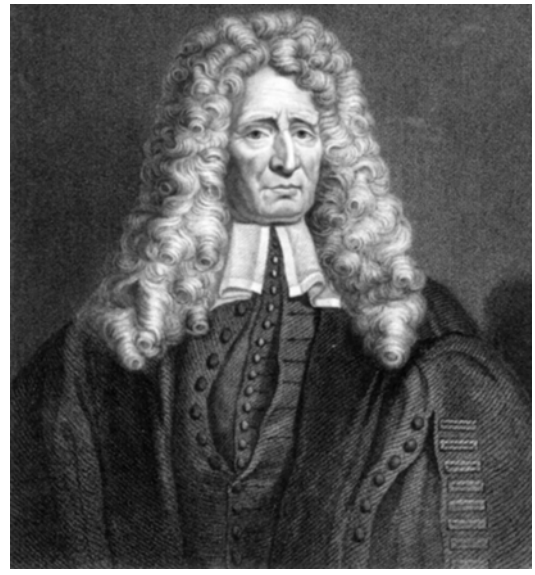

Fig. 1.6 The great anatomist Friederick Ruysch was contempory with Boerhaave but he did not agree with Malpighi's observations

In opposition with this view, Ruysch answered to his friend and colleague Boerhaave, the 1st of June, 1722 stating that: *" I had to fight, alone, against two great men: Malpighi and you, who both have a deepest knowledge of the anatomy ("fabrica") of the human body and who have almost conspired against me. You, has indeed defended the opinion ("causa") of Malpighi as it was yours. However I am not sorry, because…reading your writing I have learned something; of this I thank you".*

While Govard Bidloo (1649–1713) [6] and Boerhaave [7], following the description of Malpighi, realized the first illustrations of a skin gland, Morgagni, finally, included the term sebaceous glands ("*glandulae sebaceae*") in the index of his famous book (Figs. 1.8 and 1.9).

But the opinion of those authors was not accepted by other experts; some, as Ruysch [8], were not able to demonstrate cutaneous glands and the pores were considered the natural orifices of blood and lymphatic vessels. In his famous book of anatomy written in the second half of the eighteenth century, Antoine Portal (1742–1832) describes the sebaceous glands in brief, but these

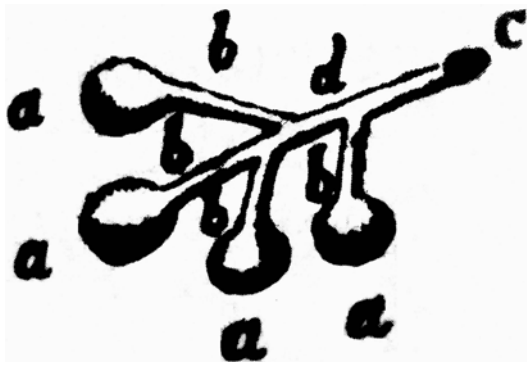

Fig. 1.7 This drawing comes from Opera postuma of Malpighi, in which the anatomist describes both the simple and composed glands

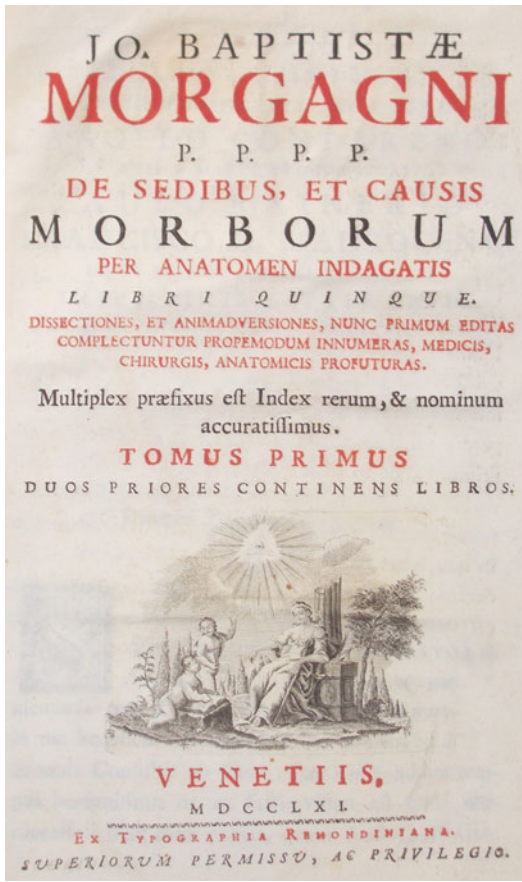
JO. BAPTISTÆ
MORGAGNI
P. P. P. P.
DE SEDIBUS, ET CAUSIS
MORBORUM
PER ANATOMEN INDAGATIS
LIBRI QUINQUE.
DISSECTIONES, ET ANIMADVERSIONES, NUNC PRIMUM EDITAS COMPLECTUNTUR PROPEMODUM INNUMERAS, MEDICIS, CHIRURGIS, ANATOMICIS PROFUTURAS.
Multiplex præfixus eſt Index rerum, & nominum accuratiſſimus.
TOMUS PRIMUS
DUOS PRIORES CONTINENS LIBROS.
VENETIIS,
MDCCLXL
EX TYPOGRAPHIA REMONDINIANA.
SUPERIORUM PERMISSU, AC PRIVILEGIO.

Fig. 1.8 The first page of the most famous book of Morgagni: "De sedibus et causi morborum per anatomen indagatis"

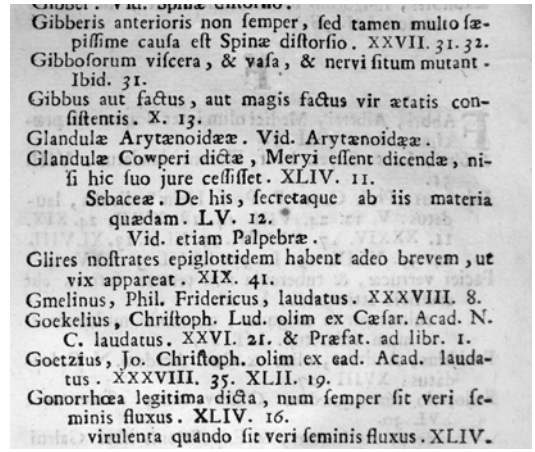
Gibberis anterioris non ſemper, ſed tamen multo ſæpiſſime cauſa eſt Spinæ diſtorſio. XXVII. 31. 32.
Gibboſorum viſcera, & vaſa, & nervi ſitum mutant. Ibid. 31.
Gibbus aut factus, aut magis factus vir ætatis conſiſtentis. X. 13.
Glandulæ Arytænoidææ. Vid. Arytænoidææ.
Glandulæ Cowperi dictæ, Meryi eſſent dicendæ, niſi hic ſuo jure ceſſiſſet. XLIV. 11.
Sebaceæ. De his, ſecretaque ab iis materia quædam. LV. 12.
Vid. etiam Palpebræ.
Glires noſtrates epiglottidem habent adeo brevem, ut vix appareat. XIX. 41.
Gmelinus, Phil. Fridericus, laudatus. XXXVIII. 8.
Goekelius, Chriſtoph. Lud. olim ex Cæſar. Acad. N. C. laudatus. XXVI. 21. & Præfat. ad libr. 1.
Goetzius, Jo. Chriſtoph. olim ex ead. Acad. laudatus. XXXVIII. 35. XLII. 19.
Gonorrhœa legitima dicta, num ſemper ſit veri feminis fluxus. XLIV. 16.
virulenta quando ſit veri ſeminis fluxus. XLIV.

Fig. 1.9 In the index of the same book, immediately below "Glandulæ Cowperi" you can read "Glandulae sebaceæ"

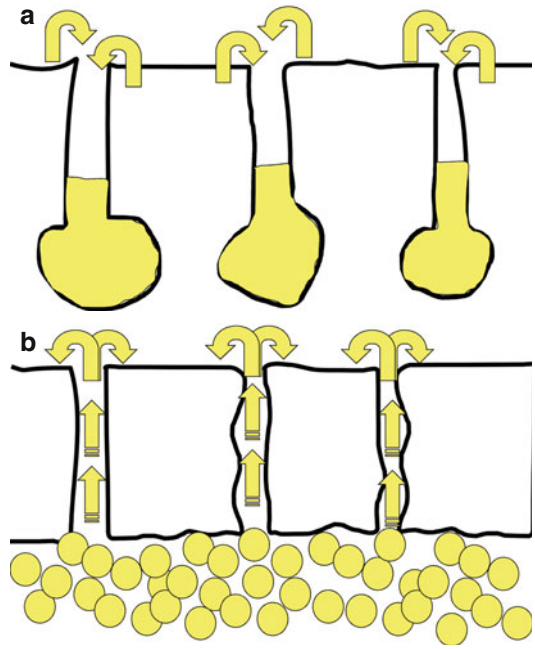

Fig. 1.10 (**a**) Portal's View: sebum comes out from the skin and fills the follicles as reservoirs. (**b**) Plenck's View: sebum comes out directly from the hypodermis

structures are not interpreted as glands but just as "reservoirs" [9] (Fig. 1.10a), while the Plenck's opinion, as previously quoted, was different but always wrong (Fig. 1.10b). Indeed, after more than one century, wrong ideas were still alive! These discussions were exposed also in the first Belgian edition of Jean Louis Alibert's (1768–1837) textbook [10].

Only in the following decades the sebaceous glands are properly described. From the beginning

and, even more, the half of the nineteenth century, the fine skin anatomy starts to develop and the studies of the physiology of the skin can be interpreted in a more scientific way, abandoning the Hippocratic School. Therefore, the modern dermatology started his contemporary path: the skin glands, including the sebaceous ones, have been studied both from anatomists and from dermatologists more and more carefully. Their size and physiology related to the age of the patient and to the site of the body have been documented in the first part of the twentieth century by various investigators.

1.2 Distribution of the Sebaceous Glands

It is a common knowledge that the sebaceous glands of man are distributed in the skin throughout all areas of the body except the palm, soles, and the dorsum of the feet. It is also known that the sebaceous glands are associated almost invariably with hair follicles, with the exception of mucous membranes where they open directly to the surface. Wherever they are found, a great variation is observed in the number of the sebaceous glands per unit area of the skin surface.

Detailed studies on the volume and density of gland distribution have been carried out mostly by Japanese authors. The historic study of Yamada in 1932 [11] calculated the gland volume in different body regions. In a middle-aged adult man, the gland volumes, in descending order of size, were found on the forehead, scalp, back, forearm, upper arm, abdomen, thigh, and calf. In the same period, the Italians Benfenati and Brillanti (1939) [12] studied the distribution of human sebaceous glands. According to these authors, the areas of the body can be divided into two broad categories, i.e., head and other areas. The face, together with the scalp, had the greatest number of sebaceous glands (up to 876 sebaceous glands per square centimeter of skin surface!). In agreement with the earlier Japanese study, these authors found that in all other areas of the body there were <100 and sometimes <50 glands per square centimeter.

Many authors, however, reported a wide variation in the number of glands in any given area from subject to subject. In general, the size of the sebaceous glands tends to be correlated with their density; in other words, the largest glands are usually found in areas where the glands are most numerous. Finally, it should be remembered that there is a wide variation in sebum production from individual to individual and in different ages of the life [13].

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