



# Theodor Kerckring (1638–1693) and his contributions to describing fetal development and craniospinal malformations

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## Background

Very little is written about Theodor Kerckring, a Dutch anatomist who lived from 1640 to 1693 mostly in Amsterdam and Hamburg. It is questionable whether he was born in Amsterdam or Hamburg [1]. He studied medicine at Leiden University and he studied under Franciscus Sylvius. Kerckring was a friend with Niels Stensen and his contemporaries included the well-known anatomists and scientists Bartholin, Pecquet, Wirsung, Brunner, de Graaf, Malpighi, Peyer, Ruysch, Swammerdam, and van Leeuwenhoek. During a period of human anatomical revelation, the Kerckring name was rarely mentioned among his contemporaries such as Vesalius, Boerhaave, and Harvey. His most renowned descriptions were of the valves of Kerckring of the small intestines, better known as the *plicae circularis* or *valvulae conniventes* [5].

In the brief life of Theodor Kerckring, he was able to write and illustrate many anatomical deformities and diseases in his book, *Spicilegium Anatomicum*. The collection contained novel findings in anatomy for his daytime. The observations were comprised of anatomical anomalies, medical diseases, and public health risks.

Kerckring's discovery of an ossicle arising from the midline of the foramen magnum (i.e., opisthial notch) and fusing with the occipital bone in a 4- to 5-month-

old fetus lives on eponymously as Kerckring's ossicle or process (Figs. 1 and 2). Virchow referred to this as a variant ossification center as the manubrium squamae occipitis, which can be doubled. However, Schmidt and Freyschmidt [4] describe the ossicle as always being present in a newborn and only occasionally seen in an adult and that it fuses with the condylar region of the foramen magnum at the second year of life. During development, the occipital neural hemiarches grow toward one another in the midline. Kerckring's ossicle develops between these merging arches. It is not clear if Kerckring's ossicle is a separate ossification center of the nuchal plate that is interposed between the occipital hemiarches or derived from other fusion processes [3]. Regardless, the anterior border of the foramen magnum is derived from the pars basilaris and the posterior aspect of the foramen arises from the occipital bone squama together with Kerckring's ossicle. The lateral portion of the foramen arises from the pars lateralis. Some have regarded Kerckring's ossicle as a remnant of the proatlas.

Kerckring's *Spicilegium Anatomicum* had observations titled Polydactylus Monster describing a congenital malformation in an infant with hypochondroplasia and polydactyly; another observation titled Pseudopolypi which referred to the formation of hematic clots in the heart, lungs, and liver after death. Depictions and detailed descriptions of large spinal lipomas, severe rachischisis, and development of the fetal and embryonic skull were firsts in their day (Fig. 3). Other observations from the book included graphically detailing the deleterious effects of smoking tobacco had on the tongue, lungs, liver, and trachea. He also noted the large size of a heart and related that to overindulgence in alcohol.

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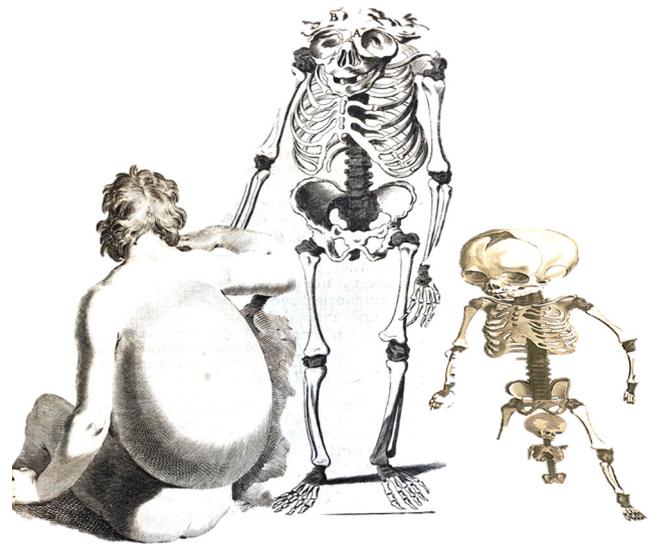
**Fig. 1** Figure and cover illustration: Painting of Theodor Kerckring with illustration of severe rachischisis from his *Spicilegium Anatomicum* seen in the lower left and a depiction of the small bony ossicle seen at the opisthion, i.e., Kerckring's ossicle

## Conclusions

Kerckring reported a variety of anatomical findings the purpose of this review paper is to bring to light his discoveries of fetal bone development and propel his translated writings to the scientific community as often, significant contributions from the past are forgotten by modern readers [2]. His illustrations and observations on the fetal skull base, rachischisis, and other congenital embryological derailments such as spinal



**Fig. 2** Fetal skull noting Kerckring's ossicle (arrow)



**Fig. 3** Collage of images from *Spicilegium Anatomicum*: Large spinal lipoma (left), fetal skeleton with severe rachischisis and anterior view of image seen in Fig. 1 (middle), infant and fetal skeletons with details of skull development (right)

lipomas were profound for their time. Our current understanding of such anatomical structures and malformations are based on early contributions such as those by Theodor Kerckring.

## Compliance with ethical standards

**Conflict of interest** The authors have no conflicts of interests to report.

## References

1. Nicholls AG (1940) Theodor Kerckring and his "Spicilegium Anatomicum.". *Can Med Assoc J* 42:480–483
2. Oostra RJ, Boer L, van der Merwe AE (2016) Paleodysmorphology and paleoteratology: diagnosing and interpreting congenital conditions of the skeleton in anthropological contexts. *Clin Anat* 29:878–891
3. Scheuer L, Black S (2004) *The juvenile skeleton*. Elsevier, London
4. Schmidt H, Freyschmidt J (1993) *Borderlands of normal and early pathologic findings in skeletal radiography*, 4th edn. Thieme, New York
5. Shafiroff BGP, Kau QY, Baron H (1959) The anatomy of Kerckring's valves: case report on their maldevelopment. *Ann Surg* 149(4):486–490. <https://doi.org/10.1097/0000658-195904000-00006>