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Perspective article

Stomatology from the popular science reading materials of the late Qing Dynasty Imperial Family: Oral anatomical diagrams in the Li Ke Guatu (illustrations of the sciences)

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On the morning of November 5, 1924, Puyi (1906–1967), who had been temporarily living in the Forbidden city for thirteen years, was suddenly told to sign a new agreement, which stipulated that the Qing Dynasty Imperial Family must move out on the same day. Puyi and his family had no choice but to hastily pack up their belongings and leave the Forbidden city. With the departure of the Qing royal family, the Forbidden city opened its doors to the world. As the Qing Dynasty Cleanup Committee checked the items in the palaces again and again, the palace life of the abdicated Qing emperor for more than ten years seemed to gradually become clear. What is even more noteworthy is that after an inventory was made, a large box containing precious cultural relics from the Yangxin Palace collection was found to have mostly ink, inkstones, seals, cultural relics, and other artifacts. However, among them, there was something such as one volume of the Li Ke Guatu (illustrations of the sciences) which was unrelated to other cultural relics. The Yangxin Palace was where the emperors of the Qing Dynasty lived. With the exception of Emperor Kangxi (1654–1722) who lived in the Qianqing Palace, all emperors since Emperor Yongzheng (1678–1735) and even the abdicated emperor Puyi lived in the Yangxin Palace. This indicates that popular science textbooks such as the Li Ke Guatu became reading materials for the late Qing Dynasty Imperial Family.[1] This study reported the oral anatomical diagrams in the Li Ke Guatu and further explored the enlightenment stage of modern stomatology in China.

The Li Ke Guatu, literally speaking, should be an educational wall chart belonging to the science category. The earliest sales advertisement related to the Li Ke Guatu appeared in the third issue of Women's Magazine in March 1915, and the Li Ke Guatu from the Yangxin Palace was the version printed and published by the Shanghai Commercial Press in February 1919. It is currently collected in the National Palace Museum, Taipei.[1] According to its table of contents, the Li Ke Guatu has seven major themes: plants, animals, minerals, natural phenomena, physics, chemistry, and physiology. The physiology has four subtopics: (1) bones, muscles, and internal organs, (2) digestive organs, (3) circulatory organs, respiratory organs, and excretory organs, and (4) ears, eyes, brain, spinal cord, and nerves (Fig. 1A).[1] The advertisement for the Li Ke Guatu specifically states that the wall chart is mainly intended to complement the new science textbooks and teaching methods published in the fall for the primary schools and is of the nature of an auxiliary teaching material. The new science textbooks refer to the Primary School Order promulgated by the Ministry of Education, Republic of China in September 1912, which officially established the subject of science and listed it as one of the compulsory courses in the primary schools. In the late Qing Dynasty and early Republic of China, in order to meet the needs of the new school system, private publishing organizations such as the Shanghai Commercial Press launched a variety of textbooks suitable for the new school system, including a series of primary school science textbooks.[1]

The physiological part of the Li Ke Guatu is quite similar to the modern human anatomy atlas. What is curious is that there are two oral anatomical diagrams in the subtopic of the digestive organs. The first oral anatomical diagram entitled the teeth exhibits mainly the gross anatomy and morphology of 16 maxillary teeth, including 8 teeth (two incisors, one canine, and five molars) with only the crowns exposed sitting on the alveolar ridge of the left maxilla, and another 8 teeth (two incisors, one canine, and five molars) with the whole teeth exposed at the position of the alveolar ridge of the right maxilla (Fig. 1B). The second oral anatomical diagram entitled the position of the salivary glands is the sagittal section of the left face showing mainly the parotid gland (upper right), the submandibular gland (lower right), and the sublingual gland (lower left) labelled in Chinese. In addition, a small mass of the accessory parotid gland and a mass of minor salivary glands within the

Figure 1 The oral anatomical diagrams in the Li Ke Guatu (illustrations of the sciences). (A) The table of contents of the Li Ke Guatu showing that there are seven major themes in this Li Ke Guatu, including plants, animals, minerals, natural phenomena, physics, chemistry, and physiology. Moreover, the physiology has four subtopics: (1) bones, muscles, and internal organs, (2) digestive organs, (3) circulatory organs, respiratory organs, and excretory organs, and (4) ears, eyes, brain, spinal cord, and nerves. In addition, there are two oral anatomical diagrams in the subtopic of the digestive organs. (B) The first oral anatomical diagram entitled the teeth, exhibiting mainly the gross anatomy and morphology of 16 maxillary teeth, including 8 teeth (two incisors, one canine, and five molars) with only the crowns exposed sitting on the alveolar ridge of the left maxilla, and another 8 teeth (two incisors, one canine, and five molars) with the whole teeth exposed at the position of the alveolar ridge of the right maxilla. (C) The second oral anatomical diagram entitled the position of the salivary glands, exhibiting the sagittal section of the left face showing mainly the parotid gland (upper right), the submandibular gland (lower right), and the sublingual gland (lower left) labelled in Chinese. These two oral anatomical diagrams were taken from an exhibition at the National Palace Museum, Taipei on March 20, 2025.

anterior ventral tongue are also demonstrated but are not labelled in Chinese (Fig. 1C).

According to the modern knowledge of oral anatomy, there are two premolars and three molars rather than five molars. Moreover, in the normal condition there are no spaces among the 16 maxillary teeth. In addition, the minor salivary glands include labial and buccal glands, glossopalatine glands, palatine glands, anterior lingual glands (glands of Blandin and Nuhn), posterior lingual mucous glands, and posterior lingual serous glands (Von Ebner's glands).[2] However, the majority of these minor salivary glands are not displayed in Fig. 1C.

Although the oral teeth and three major salivary glands presented in the two oral anatomical diagrams in the Li Ke Guatu may not be completely correct, the positions of these structures are relatively correct. This could be inferred that the artist who drew the oral anatomical diagrams might have referred to the western medical atlases at that time. Moreover, the style of the diagram has the flavor of realistic records.

The earliest modern dental treatment in China appeared in the mid-19th century and performed by the foreign dentists. Through the activities of their dental services, advanced modern dental knowledge and technology from Europe and America were gradually introduced into China.[3] It was not until the beginning of the 20th century that more accurate knowledge of oral structures began to be gradually integrated into China's formal education system. Furthermore, it was not until 1917 that China began to have an institution for cultivating the dentists when the West China Union University, located in Chengdu, Sichuan, established its dental school.[4] In conclusion, the Li Ke Guatu should have achieved its publishing goal at that time. However, in the process of pursuing new medical knowledge (of course including modern stomatology), some omissions are inevitable, resulting in some errors in the content of the popular science reading materials.[1] In any case, the emergence of the Li Ke Guatu witnessed the enlightenment stage of modern China's scientific education. Indirectly, the concepts of modern stomatology and oral health care also emerged during that period.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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