

Historical Development of Modern Anatomy Education in Japan¹⁾

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Abstract: Medical schools at the beginning of Meiji era were diverse, both in regard to their founders and their methods of education, frequently employing foreign teachers of various nationalities. In 1871, German teachers were appointed to organize medical education at the medical school of the University of Tokyo. The anatomical education at the school was conducted by German teachers, i.e. Müller (1871–1873), Dönitz (1873–1877), Gierke (1877–1880) and Disse (1880–1885), followed by Koganei, who returned from the study in Germany. At the first meeting of Japanese Association of Anatomists in 1893 [Meiji 26], the Japanese anatomy teachers met together and most of them were graduates of the University of Tokyo or fellows of its anatomy department. Before 1877 [Meiji 10], the anatomy books were mainly translated from English books, and foreign teachers of various nationalities were employed in many medical schools in Japan. After 1877 [Meiji 10], the anatomy books based on the lectures by German teachers at the University of Tokyo were published. The anatomy books after 1887 [Meiji 20] were written based on German books, and the German anatomical terms were utilized. After 1905 [Meiji 38], the original Japanese anatomy books appeared, employing international anatomical terms. In the Meiji 10s the anatomy teachers and anatomy textbooks spread from the University of Tokyo to the medical schools in Japan as the number of medical schools increased temporally. In the Meiji 20s the five national and three public medical schools in addition to the University of Tokyo provided substantial anatomy education including dissection course. Even in the early Meiji 20s these medical schools supplied only half of the newly licensed doctors, and the others were supplied through the national examination after preparatory education at private medical schools without opportunity of substantial anatomy education including dissection course.

Key words: Medical education, human anatomy, Meiji era, anatomy textbook, medical history

Current medical education in Japan, as well as in other countries in the world, presupposes a systematized educational program. Medical curricula in various countries are diverse to some extent, but share a common basic structure. First, they contain both basic disciplines, including anatomy, physiology and biochemistry, and clinical disciplines such as internal medicine, surgery and obstetrics. Second, they are systematically organized, beginning with the introduction to fundamentals, followed by advanced and applied contents. Third, they contain both lectures, to gain understanding and knowledge, and practices, to develop various skills. Although recent reforms of medical education have implemented various trials including new educational programs that do not include dissection courses (McLachlan, 2004), human anatomy, including the dissection of cadavers, is still generally thought to be a necessary and indispensable component of medical education (Granger, 2004; Korf, 2008). Modern anatomy education in the present consideration is defined as including the dissection of human cadavers and as representing a fundamental aspect of the medical education program.

Before the end of Edo era, the medical practice in Japan was based on the traditional medicine following

the Chinese medicine. The doctors were not educated in medical schools, but studied as apprentices under prominent doctors. The systematized educational program of medicine including anatomy was imported from the Europe into the newly established medical schools early in the Meiji era. Thereafter the modern anatomy education was to develop in contents and in dimension in Japanese medical schools by means of 1) teachers of anatomy, 2) dissection course using cadavers, and 3) textbooks of anatomy. In the present article we clarify the developmental steps of modern anatomy education in Japan. In addition, the transition of Japanese medical schools is briefly summarized to consider the role of anatomy education to supply the increasing number of doctors in early Meiji era.

A) Beginnings of human dissection and modern anatomy education in Japan

The first dissection of the human body in Japan was conducted by Tōyō Yamawaki (1705–1762) who succeeded in 1754 to get official permission in Kyoto for dissection of a decapitated criminal. After observation of the autopsy with other physicians, Yamawaki published the book “Zōshi”, meaning “notes on viscera”, with anatomical illustrations done in wood engravings in 1759. The great impact of European medicine was furthered by the publication of “Kaitai Shinsho” (1774), meaning “new book of anatomy”, which was a translation of the Dutch book on anatomy “Ontleekundige tafelen” (1734), originally written in German by Johann Adam Kulmus (1689–1745) with title of “Anatomische Tabellen” in 1722. The project of translation had been undertaken by Gempaku Sugita (1733–1817) and Ryōtaku Maeno (1723–1803), when they observed dissection of a female body after execution in 1771 at Kotsugahara in Edo (today called Tokyo). After “Kaitai Shinsho”, Japanese doctors frequently attended dissections of executed bodies, and observed precisely the interiors of the cadavers. The observations were recorded in a number of anatomical illustrations such as “Heijirō Kaibōzu (Heijirō’s Anatomical Illustration)” (1783) by Genshun Koishi (1743–1809) and “Kaibō Sonshin-zu (True Anatomy Illustration)” (1819) by Yasukazu Minagaki (1785–1825). These illustrations showed that the dissection of cadavers in the Edo era of Japan were not imitations of European anatomy, but contained original and careful observations (Japan Academy, 1955). However, in the Edo era human dissections were not performed by Japanese doctors as a part of the medical education program for medical students. They were performed only for research or self-education.

A systematized medical education program was first introduced in Japan by the Dutch physician Pompe van Meerdervoort (1829–1908), who was invited by the Tokugawa Shogunate. He embarked on the Dutch frigate steamer *Japan* (later *Kanrin Maru*) to Nagasaki on the 21st of September 1857. He opened a medical school at the west office of the Nagasaki Magistrate, and it moved to the former residence of Shūhan Takashima at Ōmura-chō (now Higashi Kojima) immediately. To enable efficient medical education, Pompe proposed the establishment of a Western style hospital, and to permit dissection of human cadavers. The former proposal was realized at the hospital called “Yōjō-sho (Curing station)” and the school called “Igaku-sho (Medical office)” at Sako (now Nishi Kojima, the location of the Sako primary school). The latter effort was difficult to accomplish because of Japanese custom and religion at first. Dissection was finally permitted by the Shogunate in October 1858, and the first dissection of cadavers for medical education was performed on the 9th of September 1859 for three days. The demonstration was witnessed by 45 male doctors and one female doctor. Pompe demonstrated the dissection of cadavers at

Table 1. Time table of medical education by Pompe (after T. Miyanaga “Pompe — the father of modern medicine in Japan” 1985)

Date	Events
1857/11/12	Opening of medical school. The students were 12 in number at first. The lectures were 4 or 5 hours per day. The lectures included physics, chemistry, anatomy, physiology, pathology, pharmacy, internal medicine and surgery.
1859/9/9	Dissection of the cadaver was demonstrated for three days, witnessed by 45 male and one female doctors, guarded by 150 police officers.
1861/9/21	Opening of Yōjō-sho (Curing station) and Igaku-sho (Medical office).
1862/7/1	The lectures were practically ended.
1862/10/15	The 60 disciples were given diplomas, divided into three classes. 21 were graded as first rank, 16 as second, and 23 as third rank, respectively. Disciples transmitted by Matsumoto numbered 135.

least three times in Nagasaki. He recalled in later years the episode of getting over the difficulty to perform dissection in Japan (Numata and Arase, 1968; Wittermans and Bowers, 1970).

The medical education by Pompe was systematically arranged, containing lectures on physics, chemistry, anatomy, physiology, pathology, pharmacy, internal medicine and surgery, although the details of curriculum are obscure. Pompe’s leading disciple was Ryōjun Matsumoto (1832–1907), who recorded the names of the 135 disciples he mediated (Nagasaki University, 1961). When the medical education ended, Pompe gave the disciples diplomas divided into three classes. The first represented those who had completed the studies with high commendation and were sufficiently qualified to practice, the second, those worked well and could give help, if necessary, and the third, those who had attended the classes but without notable results, not being sufficiently qualified to treat patients independently (Miyanaga, 1985) (Table 1).

At the beginning of the Meiji era, since 1868, many han (domains) established medical schools; most of which were closed when the han organizations were substituted by those of prefectures in 1871 [Meiji 4] (Kira, 2005). These medical schools employed foreign teachers of various nationalities, including those from Holland, America, England and France, and therefore the contents of medical education in these schools were diverse. The diversity of medical education continued until early in the Meiji 10s, since 1877. Thereafter German medicine came to exert more and more influence on Japanese medical education, alongside with the institutions of medical education and medical licensing that were introduced and refined throughout Japan. The German influence in medicine was testified to by the publication of medical books based on German ones, use of German vocabulary in clinics, and the numbers of Japanese medical doctors studying in Germany.

The German style of medicine in Japan originated from the national medical school in Tokyo (now Faculty of Medicine, University of Tokyo). After the Meiji Restoration, the Meiji government determined to reform medical education by adopting Western medicine. It established the national medical school as the kernel of medical education, and was determined to employ German teachers in the school. The following discussion explains how the German style of medical and anatomical education in the national medical school in Tokyo was propagated in the medical schools throughout Japan in the following years.

B) Medical school of the University of Tokyo and the teachers of anatomy in the early Meiji era

The medical school of the University of Tokyo originated from the Shutō-sho (Institute for vaccination) at Otamaga-Ike, established in 1858, and restarted after Meiji Restoration as Igaku-sho (Medical office) by the government in 1868 [Meiji 1]. Since then it changed location two times in 10 years, finally moving to the place of the former residence of the daimyo (feudal lord) of the Kaga in Hongo, and it changed its name six times to become the Faculty of Medicine in the University of Tokyo (University of Tokyo, 1967) (Table 2).

The first dissection of human cadavers at the University of Tokyo was performed on the 14th of August, 1869. The cadaver of a 34 years old woman called “Miki” was dissected. Her family had presented a document in which her wish to donate her body was stated. After the dissection, the medical school requested the government to permit the dissection of cadavers for educational purposes, and asked for permission to use the corpses of executed or deceased criminals and those deceased without relatives for dissection. The request was permitted on the 20th of October, 1870, and thereafter a number of cadavers were supplied to the medical school for dissection. According to the records of the University of Tokyo, the executed criminals were most frequently dissected at first, and after 1876 the deceased criminals were most frequently dissected. After 1876, the deceased from the hospital of medical school were also dissected, probably for pathological examination and not for anatomy education (University of Tokyo, 1967) (Table 3).

In 1869 [Meiji 2] the government determined to introduce medicine from Germany to Japan, and made

Table 2. Summary of changing titles and locations of the Faculty of Medicine, University of Tokyo. (after “Centennial history of Faculty of Medicine, University of Tokyo.” 1967)

Date	Names	Locations	Notes
1868/6/26	Igaku-sho [Medical office] (second)	Shimoya Izumibashi-dōri	revived by Meiji government
1869/2	Igakkō and Byōin [Medical School and Hospital]	Shimoya Izumibashi-dōri, former house of Tōdō	
1869/12/17	Daigaku Tōkō [University East School]	as above	in contrast to Daigaku and to Daigaku Nankō
1871/7/18	Tōkō [East School]	as above	
1872/8/3	First Large District, Medical School	as above	
1874/5/7	Tokyo Medical School	as above; Hongō, the former Kaga Residence	before 1876/12; thereafter
1877/4/12	University of Tokyo, Faculty of Medicine (first)	as above	
1886/3/1	Imperial University Medical College	as above	by ordinance for Imperial University
1897/6/18	Tokyo Imperial University, Medical College	as above	by ordinance for Imperial University
1919/4/1	Tokyo Imperial University, Faculty of Medicine	as above	by ordinance for Imperial University
1947/10/1	University of Tokyo, Faculty of Medicine (second)	as above	by system of national general university

Table 3. Annual statistics of dissected cadavers in early Meiji era at the Faculty of Medicine, University of Tokyo. (after “Centennial history of Faculty of Medicine, University of Tokyo.” 1967)

	Deceased inpatients	Deceased unknowns and prisoners	Hanged	Decapitated	Total
1869	1				1
1870	3		4	48	55
1871			13	81	94
1872			23	30	53
1873		13	18	44	75
1874		7	10	70	87
1875		14	6	64	84
1876	14	56	4	61	135
1877	15	87	1	8	111
1878	20	109		6	135
1879	5	153	1	6	165
1880	20	115		2	137
1881	12	188		7	207
1882	36	78	3		117
Total	126	820	83	427	1456

contract with Max von Brandt, representative of the “Norddeutscher Bund” to employ German doctors. The first German medical teachers, Müller and Hoffmann, arrived at the medical school in late August, 1871 [Meiji 4]. Müller was a Prussian chief staff-surgeon and Hoffmann was a Prussian fleet surgeon. They were provided absolute power to organize medical education in Japan, and organized the education at the Tokyo medical school fundamentally. When they arrived at the school in which about 300 students studied medicine, the students’ academic ability was so low that they could neither read German textbooks nor communicate with German teachers even with help of translators, and 10 to 15 students made groups around table to decode German medical books together. In order to resolve the problems of medical education, Müller removed all the students, and based on the results of an examination, allowed 40 students to take the medical course and 60 students to take the preparatory course. The preparatory course required 3 years and the medical course 5 years. Additional German teachers were invited to teach liberal arts, basic medicine and clinical medicine, at the request of Müller. Thus the transplantation of German medical school into Japan was accomplished (Müller, 1888; Ishibashi et al. 1975). Müller taught surgery, gynecology and ophthalmology, and Hoffmann taught internal medicine. The lecture of anatomy was done by Müller and Hoffmann, dissection was directed by Kazuyoshi Taguchi (1839–1904 [Tempo 10–Meiji 37]).

Benjamin Carl Leopold Müller (1824–1893) was born on the 24th of June, 1824 in Mainz, studied medicine at the universities of Bonn and Berlin, and became teacher of Medicinisch-chirurgisches Friedrich-Wilhelm-Institut, and was in service in the Austro-Prussian War (1866) and Franco-Prussian War (1870–1871). He taught medicine at the Tokyo medical school from 1871 for three years and established the fundamental framework of the school, and then moved to the Imperial Household Agency. After returning to Germany he became director of the hotel for invalids in Berlin. In 1888 he published records of his stay in Japan as “Tokio-Igaku” in *Deutsche Rundschau* (Müller 1888). He died on the 13th of

Table 4. Professors of anatomy at the faculty of medicine in the university of Tokyo. (after “Centennial history of Faculty of Medicine, University of Tokyo.” 1967)

Date	Events
1871/8/late	Assignment of Müller (surgery) and Hoffmann (medicine)
1873/7/9	Assignment of Dönitz, lectures on anatomy (until 1876/2/4)
1874/8/24	Expiration of term of Müller and Hoffmann (left for home in 1875/11)
1876/6/26	Taguchi became Professor of Anatomy (until 1904/2/4)
1877	Arrival of Gierke (anatomy), (until 1880/5/31)
1877	Construction of the new dissection laboratory near the Yayoi gate.
1880/2/27	Arrival of Disse, lectures on anatomy (until 1885 on anatomy, until 1867 on pathology)
1885/9/11	Start of lectures on anatomy by Koganei, who returned from Germany in 1885/6, and became Professor of anatomy on 1886/3/6

September, 1893 (Ishibashi and Ogawa, 1969).

Theodor Eduard Hoffmann (1837–1894) was born on the 17th of October, 1837 in Friedeberg (now Strzelce in Poland), studied medicine at the University of Breslau, became a private lecturer under the pathologist Traube in Berlin, and became the navy surgeon. In 1871 he came to Japan with Müller to teach medicine at the Tokyo medical school and then moved to the Imperial Household Agency. After returning to Germany he worked as garrison doctor at Rastatt in Baden for a while. He died on the 1st of April, 1894 (Ishibashi and Ogawa, 1969).

After Müller and Hoffmann, three German teachers came to the Tokyo medical school to teach anatomy; namely Dönitz, Gierke and Disse. From 1873 [Meiji 6] to 1885 [Meiji 18], they lectured anatomy at the school. After Yoshiakiyo Koganei came back from Germany and became the professor of anatomy in 1886, Japanese doctors lectured anatomy (Table 4).

Friedrich Karl Wilhelm Dönitz (1838–1912) was born on the 27th of June, 1838 in Berlin, studied medicine at the University of Berlin, and conducted research under Professor Raichert. He moved to Japan in 1873 [Meiji 6] and taught anatomy at the Tokyo medical school for three years, and then worked for the Metropolitan Police Department. In between he visited Hakone, Odawara, Mount Fuji and Nikko in holidays to collect specimens of spiders, myriapods and shellfish which he brought to Germany. He worked from 1879 [Meiji 12] to 1886 [Meiji 19] as a doctor and teacher in Saga prefecture. After returning to Germany he conducted research on infectious diseases under Koch at the Institut für Infektionskrankheiten in Berlin. He died on the 12th of March, 1912 (Shinohara, 1995). The anatomy lectures of Dönitz contained the latest findings of histology. The anatomy books “Kaibō Ran’yō” (1877) by Kazuyoshi Taguchi and “Kaibō Taizen” (1883) by Gen-ichirō Narasaka were written following the lectures by Dönitz.

Hans Paul Bernard Gierke (1847–1886) was born on the 19th of August, 1847 in Stettin (now Szczecin in Poland), studied medicine to get degree in Würzburg, and went to Breslau, where he conducted physiological research on the respiratory center. Then he became an assistant in anatomy under Kölliker, who recommended him as a teacher to the Tokyo medical school. He taught anatomy in Tokyo from 1877 [Meiji 10] for three years, and came back to Germany due to his unfavorable adaptation to Japanese climate and illness. After returning to Germany in 1882 [Meiji 15] he took up the post of professor of physiology at Breslau, but died on the 8th of May, 1886 (Ishibashi and Ogawa, 1969). His name is pre-

served in the tractus solitarius (Gierke's respiratory bundle) in the brain stem.

Joseph Hugo Vincent Disse (1852–1912) was born on the 25th of December, 1852 in Brakel an der Weser, and studied medicine in Göttingen, Würzburg, München and Erlangen to get degree in 1875, followed by four years of postgraduate work in anatomy at Strasbourg under Waldeyer. Thereupon he accepted an appointment as professor of anatomy at the Tokyo medical school until 1887 [Meiji 20]. After returning to Germany he joined the anatomy institute at the University of Göttingen and became associate professor in 1894. He moved to Halle and to Marburg, and died on the 9th of July, 1912. He published his monumental work on the lymphatic tracts of the mammalian liver in which he described the narrow space between the fenestrated sinusoidal endothelium and hepatocytes, now bearing his name (Space of Disse) (Schmid, 1991).

Yoshikiyo Koganei (1859–1944 [Ansei 5–Showa 19]) was born on the 14th of December, 1859 in Niigata and studied medicine at the Tokyo medical school. After graduation he went abroad to study anatomy under Professor Waldeyer in Germany, and then returned to Tokyo to become the first Japanese professor of anatomy at the University of Tokyo (University of Tokyo, 1967).

In 1887 [Meiji 20] when the medical schools in the Imperial University and five senior middle schools were established and others were restricted, the anatomy teachers in these medical schools were either the bachelors of medicine from the faculty of medicine in the University of Tokyo or those who had studied anatomy in the department of anatomy at that university. On the 20th of July 1893 [Meiji 26], the first meeting of Japanese association of anatomists was held at the department of anatomy at the University of Tokyo. The meeting, which was initiated at the suggestion of Professor Taguchi of the University of Tokyo, was attended by representatives of the departments of anatomy of the medical schools in Japan. At this meeting, the establishment of the association and the annual meeting of members were agreed upon. At this time, there were six national medical schools under the control of the Ministry of education, including one university and five senior middle schools, three public medical schools in Kyoto, Osaka and Aichi, and four private medical schools. In addition there were the naval medical school and the army medical school in Tokyo.

At the first meeting of the Japanese association of anatomists, ten representatives attended on the day, and two representatives came to the department of anatomy in the university on the next day. In addition, there were two who supported the meeting but did not attend. The attendants and supporters of the association included five members of the college of medicine in the Imperial University, and representatives from the five senior middle schools, the three public medical schools in Kyoto, Osaka and Nagoya, as well as those from the naval and army medical schools. For the most of the members personal history in the college of medicine in the Imperial University was confirmed, except for those in the first and third senior middle schools in Chiba and Okayama and the army medical school (Japanese Association of Anatomists, 1995). Thus it is clear that in the later half of the Meiji 20s most of the teachers of anatomy in Japanese medical schools were either the bachelors of medicine who had graduated from the Faculty of Medicine in the University of Tokyo or those who had personal relationship with the department of anatomy in that university. (Table 5)

Table 5. List of participants at the first meeting of Japanese Association of Anatomists in 1893 [Meiji 26].

Name	Affiliation	Status	Academic background
Kazuyoshi Taguchi	Imperial University, College of Medicine	attend	
Yoshikiyo koganei	Imperial University, College of Medicine	attend	Graduated from the University of Tokyo in 1880 [Meiji 13]
Gakutarō Ōsawa	Imperial University, College of Medicine	attend	Graduated from the University of Tokyo in 1887 [Meiji 20]
Buntarō Suzuki	Imperial University, College of Medicine	attend	Graduated from the University of Tokyo in 1888 [Meiji 21]
Kikun Takezaki	Imperial University, College of Medicine	attend	
Harujirō Arai	First High School, Faculty of Medicine (Chiba)	attend	
Unknown ¹⁾	Second High School, Faculty of Medicine (Sendai)	absent	(the professor of histology graduated from the University of Tokyo)
Munekazu Tsuge	Third High School, Faculty of Medicine (Okayama)	absent	
Shōji Yoshimura	Third High School, Faculty of Medicine (Okayama)	absent	
Masuzu Tanaka ²⁾	Fourth High School, Faculty of Medicine (Kanazawa)	visit on the next day	(the professor graduated from the University of Tokyo)
Ryūtoku Koyama	Fifth High School, Faculty of Medicine (Nagasaki)	visit on the next day	Graduated from the University of Tokyo in 1887 [Meiji 20]
Gen'ichirō Narasaka	Aichi Medical School	absent	Graduated from the University of Tokyo in 1881 [Meiji 14]
Keitarō Kamon	Kyoto Prefectural Medical School	attend	Graduated from the University of Tokyo in 1890 [Meiji 23]
Jirō Kaneko	Osaka Medical School	attend	Studied anatomy in the University of Tokyo
Yatarō Ōta	Naval Medical School	attend	Graduated from the University of Tokyo in 1882 [Meiji 15]
Ikka Nakajima	Army Medical School	attend	

1) Professor Morikazu Uchida of histology graduated from the University of Tokyo in 1883 [Meiji 16]

2) Tanaka was an associate professor. Professor Yasusuki Kawase graduated from the University of Tokyo in 1887 [Meiji 20]

C) Anatomy books in the Meiji era.

Anatomy textbooks were one of the most important learning materials for medical students. The anatomical textbooks objectively described the human body structures, but the composition of the contents and the terms selected may have been diverse. The technical conditions such as printing (wood printing, type-printing etc.), bookbinding (Japanese style, European style), illustrations (copper engraving, wood engraving etc.) affected the published anatomy textbooks.

In the Meiji era, many anatomy textbooks were published. The transformation of the form and contents of the anatomy textbooks may be divided into 4 periods. (Table 6)

1) The first period; from 1868 to 1877 [Meiji 1–10]: Anatomy books translated from English

The anatomy textbooks in the first period were either complete or abridged translations of English books. Examples from this period include “Kaibō Kummō” (Anatomy Enlightenment) translated by

Table 6. Chronological classification of anatomy textbooks in the Meiji era.

<p>First period, 1868–1877 [Meiji 1–10]: Anatomy books translated from English books</p> <p>Shinoda H. (tr). “Kaitai Setsuyaku (Anatomy Explained Epitomized)” in 2 vols., Japanese bookstyle, 1870 [Meiji 3]</p> <p>Matsumura N. (tr). “Kaibō Kummō” (Anatomy Enlightenment)” in 20 vols., Japanese bookstyle, 1872 [Meiji 5]</p> <p>Take S. (tr). “Kaitai Setsuryaku (Anatomy Explained Simplified)” in 3 vols., Japanese bookstyle, 1873 [Meiji 6]</p> <p>Okazawa T. (tr). “Kaibō Hikkei (Anatomy Handbook)” in 6 vols., Japanese bookstyle, 1873 [Meiji 6]</p> <p>Murakami T. (tr). “Kashi Kaibō Tekiyō (Mr. H’s anatomy epitomized)” in 9 vols., Japanese bookstyle, 1877 [Meiji 10]</p>
<p>Second period, 1877–1887 [Meiji 10–20]: Anatomy books based on German lectures</p> <p>Faculty of Medicine, University of Tokyo (ed). “Ika Zensho Kaibō-hen (Medical Series Anatomy Edition)” in 24 vols., 1877–1884 [Meiji 10–17]</p> <p>Taguchi K. “Kaibō Ran’yo (Epitome of Anatomy)” in 13 vols., 1877–1882 [Meiji 10–15]</p> <p>Narasaka G. “Kaibō Taizen (Complete Anatomy)” in 3 vols., 1883 [Meiji 16]</p>
<p>Third period, 1887–1904 [Meiji 20–37]: Anatomy books based on German books</p> <p>Imada T. “Jitsuyō Kaibōgaku (Practical Anatomy)” in 3 vols., 1887</p> <p>Nakajima I. “Kaibōgaku Kōhon (Anatomy Lecture Book)” in 3 vols., 1893–1894 [Meiji 26–27]</p> <p>Ishikawa Y. “Jintai Kaibōgaku (Human Anatomy)” in 5 vols., 1903–1904 [Meiji 36–37]</p> <p>Ishihara H. (ed). “Jintai Kaibōgaku (Human Anatomy)” in 3 vols., 1903–1911 [Meiji 36–44]</p>
<p>Fourth period, from 1905 [Meiji 38]: Anatomy books written originally</p> <p>Ōsawa G. “Shinsen Kaibōgaku (New Edition of Anatomy)” in 4 vols., 1905–1911 [Meiji 38–44]</p> <p>Morita S. “Kaibōgaku Kōgi (Anatomy Lecture)” in 3 vols., 1906–1909 [Meiji 39–42]</p> <p>Futamura R. “Kinsei Kaibōgaku (Modern Anatomy)” in 2 vols., 1907 [Meiji 40]</p>

Noriaki Matsumura, in 20 volumes in Japanese bookbinding (1872 [Meiji 5]) and “Kaibō Hikkei” (Anatomy Handbook) translated by Teiichirō Okazawa, in 6 volumes in Japanese bookbinding (1873 [Meiji 6]). The original of “Kaibō Kummō” was “An elementary treatise on human anatomy” (1861) by J. Leidy, and that of “Kaibō Hikkei” was “Practical anatomy; a new arrangement of the London dissector” 2nd edition (1868) by D. H. Agnew (Figs. 1 and 2).

Noriaki Matsumura (1842–1877 [Tempō 13–Meiji 10]) was a former doctor of the Ōhno Han who had studied English and medicine in Edo and served in the Hakodate War (1868–1869 [Meiji 1–2]). He taught medicine in the Osaka medical school as a minor professor and in the Sakai prefecture medical school as a full professor in addition to conducting private medical practice. He translated many English medical books, including “Kaibō Kummō”, “Gurei-shi Kaibō Kummō-zu” (Gray’s Anatomy Enlightenment Illustrations), and “Kaibō Tekiyō” (Anatomy Synopsis) (Iwaji, 1992).

2) The second period; from 1877 to 1887 [Meiji 10–20]: Anatomy books based on German lectures

Anatomy textbooks in the second period were documented on the basis of lectures by German teachers at the Faculty of Medicine in the University of Tokyo. Examples from this period are “Ika Zensho Kaibō-hen” (Medical Series Anatomy Edition) edited by Faculty of Medicine, University of Tokyo, in 24 volumes (1877–1884 [Meiji 8–11]), “Kaibō Ran’yo” (Epitome of Anatomy) by Kazuyoshi Taguchi in 13 volumes in 14 books in Japanese bookbinding (1877–1882 [Meiji 10–17]), and “Kaibō Taizen” (Complete Anatomy) by Gen’ichirō Narasaka in 3 volumes (1883 [Meiji 16]) (Figs. 3, 4 and 5).

“Ika Zensho Kaibō-hen” was a translation of the record of the lectures given by Müller and Hoffmann at the Faculty of Medicine in the University of Tokyo (Shimada, 2006). Translation and records were done by Genshū Yamazaki (1845–1910 [Kōka 2–Meiji 43]) who graduated from the Faculty of Medicine in 1876 [Meiji 9].



Fig. 1. Noriaki Matsumura (tr) “Kaibō Kunmō” (Anatomy Enlightenment) 20 vols. in 19. Owned by T. Sakai.

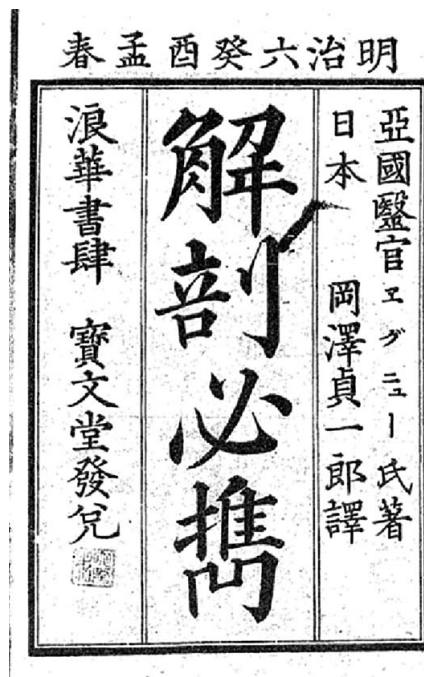


Fig. 2. Teiichirō Okazawa (tr) “Kaibō Hikkei” (Anatomy Handbook) in 6 vols., title page. Owned by National Diet Library.

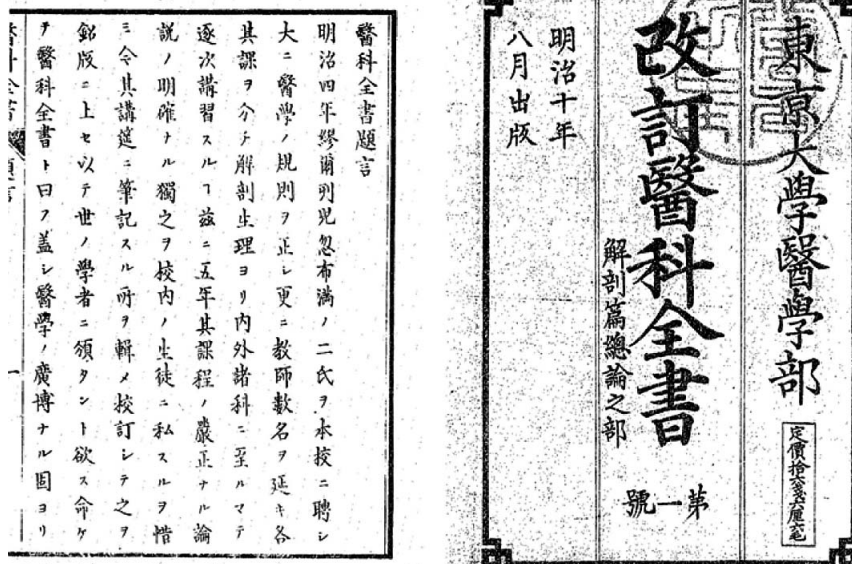


Fig. 3. Faculty of Medicine, University of Tokyo (ed) “Ika Zansho Kaibō-hen” (Medical Series Anatomy Edition) in 24 vols., title page and preface notes. Owned by National Diet Library.



Fig. 4. Kazuyoshi Taguchi “Kaibō Ran’yō” (Epitome of anatomy) in 13 vols. in 14 books. Owned by T. Sakai.

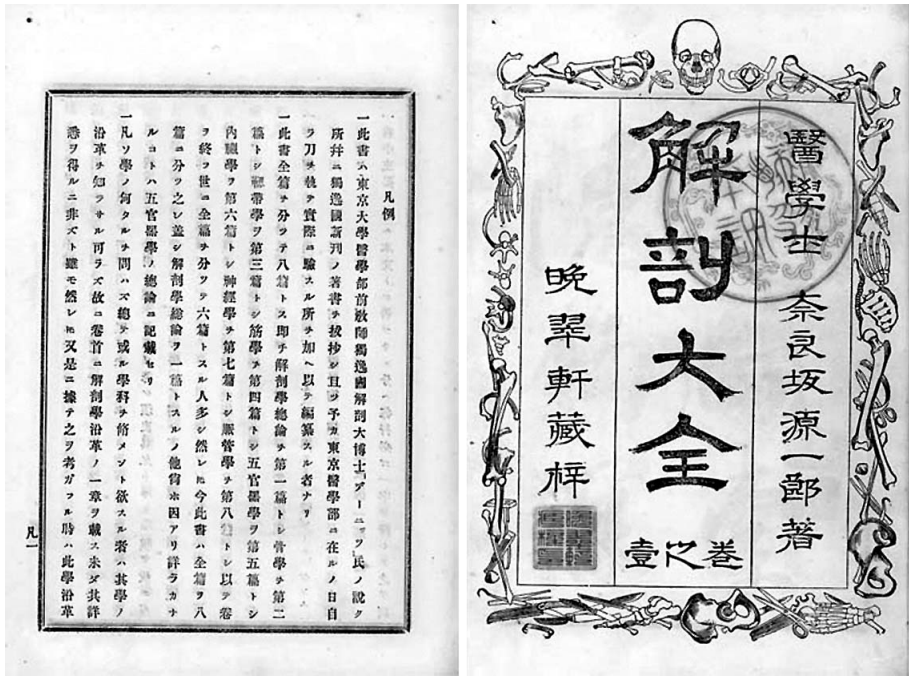


Fig. 5. Gen'ichirō Narasaka "Kaibō Taizen" (Complete Anatomy) in 3 vols., title page and explanatory notes. Owned by T. Sakai.

Kazuyoshi Taguchi (1839–1904 [Tempō 10–Meiji 37]), born as a son of a doctor of Chinese medicine, studied Rangaku (Dutch Sciences) under Dōkai Hayashi in Edo at the end of the Tokugawa Shogunate. He started medical practice at Sano in Shimotsuke (now Tochigi prefecture). Thereafter he studied anatomy in the East School of the University (later Faculty of Medicine, University of Tokyo), and was promoted to the teacher of anatomy. He dissected cadaver of the lady Miki in 1869. In 1877 [Meiji 10] when the faculty of medicine at the University of Tokyo opened, he was appointed as the first Japanese professor. He studied in Germany (1887–1889 [Meiji 20–22]) and organized the Japanese Association of Anatomists in 1893 [Meiji 26] in which he became the first president (Kitakawabe-chō, 2005). He wrote "Kaibō Ran'yō" on the basis of the lectures by Dönitz at the faculty of medicine in the University of Tokyo as well as on the basis of English and German anatomy books. "Kaibō Ran'yō" contained no anatomical illustrations.

Gen'ichirō Narasaka (1854–1934 [Ansei 1–Showa 9]) graduated from the faculty of medicine of the University of Tokyo in 1881 [Meiji 14], and then became a teacher at the Aichi medical school, teaching histology, and systematic and topographical anatomy. He wrote many books on anatomy, including "Kaibō Taizen" (1883 [Meiji 16]), "Kammei Soshikigaku" (Simple histology) (1888 [Meiji 21]), "Kaibō Kammei" (Anatomy Simplified) (1894 [Meiji 27]), "Kammei Taiseigaku" (Simple Embryology) (1895 [Meiji 28]), and "Kyokusho Kaibōgaku Kō'hon" (Topographical Anatomy Lecture Book) (1902 [Meiji 21]) (Narasaka, 2004). He wrote "Kaibō Taizen" on the basis of the lectures by Dönitz at the University of Tokyo as well as based on German books and his own experience at the University of Tokyo. "Kaibō Taizen" contained no anatomical illustrations.



Fig. 6. Tsukanu Imada “Jitsuyō Kaibōgaku” (Practical Anatomy) in 3 vols., 13th to 15th editions, title pages. Owned by T. Sakai.

3) The third period; from 1887 to 1904 (Meiji 20–37): Books based on German books

Anatomy textbooks in the third period were written on the basis of German anatomy books. Examples from this period include “Jitsuyō Kaibōgaku” (Practical Anatomy) by Tsukanu Imada in three volumes (1887 [Meiji 20]), and “Jintai Kaibōgaku” (Human Anatomy) by Yoshinao Ishikawa in five volumes (1903–1904 [Meiji 36–37]), and “Kaibōgaku Kō'hon” (Anatomy Lecture Book) by Ikka Nakajima in three volumes (1893–1894 [Meiji 26–27]) (Figs. 6, 7 and 8).

Tsukanu Imada (1850–1889 [Kaei 3–Meiji 22]) was not educated in the medical school, but was employed as an assistant of anatomy at the Faculty of Medicine in the University of Tokyo, and studied anatomy under Professor Taguchi. He was promoted to associate professor in 1881 [Meiji 14] (Yoshioka, 2004). “Jitsuyō Kaibōgaku” was a very popular textbook of anatomy containing abundance of anatomical illustrations. In the preface he referred to the anatomical or histological German textbooks by Henle, Hyrtl, Hoffmann, Meyer, Bock, Hollstein, Gegenbaur, Pansch, and Orth.

Yoshinao Ishikawa (1859–1916 [Ansei 6–Taisho 6]) studied anatomy in the Department of Anatomy at the faculty of medicine of the University of Tokyo, moved to the Osaka medical school in 1886 (Meiji 19), and to the faculty of medicine in the 4th senior middle school in Kanazawa where he became a professor in 1901 (Meiji 34) (Kanazawa University, 1972). “Jintai Kaibōgaku” was a beautiful textbook of anatomy, which included numerous precise anatomical illustrations. He referred to several German anatomy textbooks such as those by Richter, Henre, Rauber, Pansch and Toldt.

4) The fourth period; from 1905 [Meiji 38] on: Original books on anatomy

Anatomy textbooks in the fourth period were written originally by Japanese authors. Early examples from this period include “Shinsen Kaibōgaku” (New Edition of Anatomy) by Gakutarō Ōsawa (1863–1920 [Bunkiyū 3–Taisho 5]), professor of anatomy in the University of Tokyo, in four volumes (1905–1911 [Meiji 38–44]), and “Kinsei Kaibōgaku” (Modern Anatomy) by Ryōjiro Futamura (died in 1928 [Showa 3]), associate professor of anatomy in the University of Tokyo, in two volumes (1907–1908 [Meiji 40–

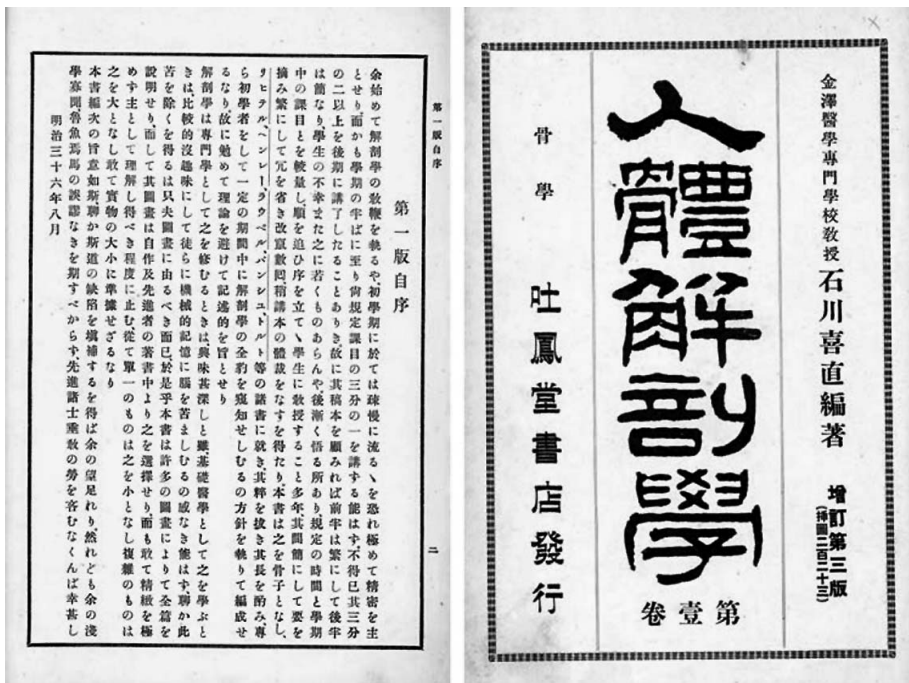


Fig. 7. Yoshinao Ishikawa “Jintai Kaibōgaku” (Human Anatomy) in 5 vols., enlarged 3rd ed., title page and introduction to the first edition. Owned by T. Sakai.

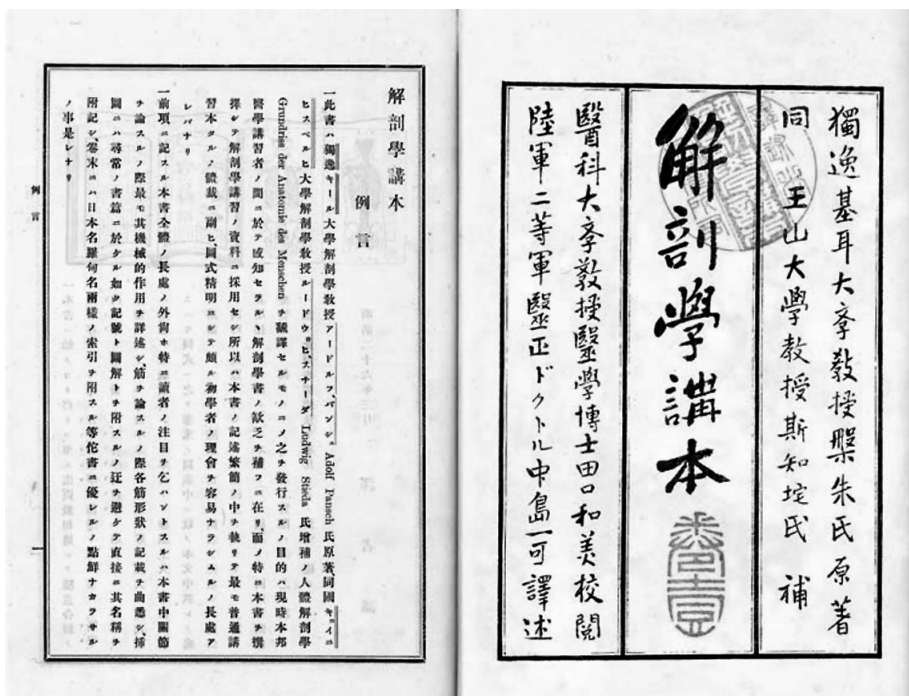


Fig. 8. Ikka Nakajima “Kaibōgaku Kō'hon” (Anatomy Lecture Book) in 3 vols., title page and explanatory notes. Owned by T. Sakai.

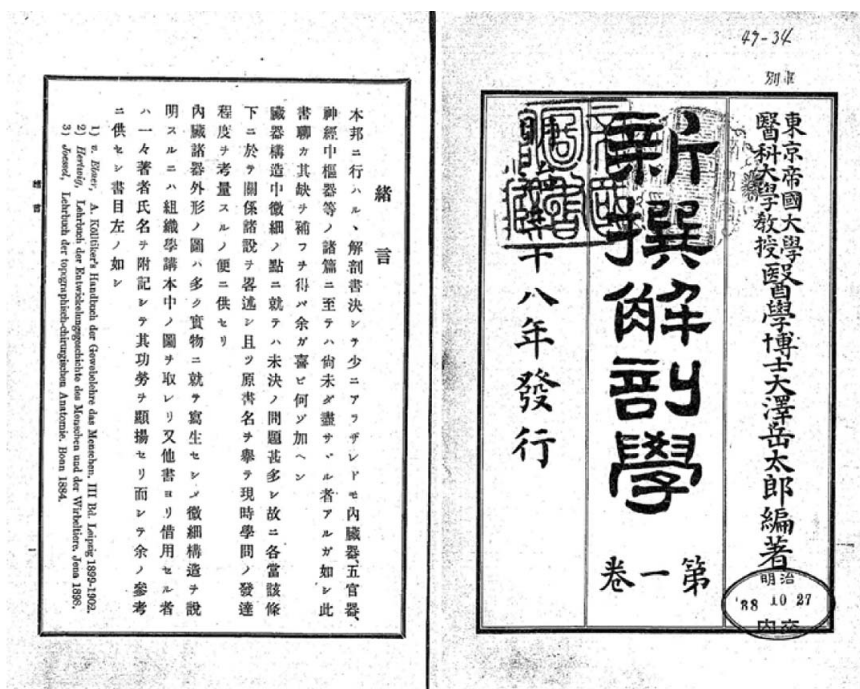


Fig. 9. Gakutarō Ōsawa “Shinsen Kaibōgaku” (New Edition of Anatomy) in 4 vols., title page and introductory notes. Owned by National Diet Library.

41]), and “Kaibōgaku Kōgi” (Anatomy Lecture) by Seiji Morita (1877–1943 [Meiji 10–Showa 18]), lecturer in the Tokyo Jikei Hospital, in three volumes in four books (1907 [Meiji 40]). All of these textbooks employed Japanese terms together with Latin terms in “Nomina anatomica” published in 1895 as well as German terms (Figs. 9, 10 and 11).

D) Institution of medical education and medical licenses in the early half of Meiji era

The medical education in Japan was diverse and not well organized at the beginning of the Meiji era. Through the development of the general educational system and state examinations for medical practice, medical education became standardized by about the 1887 [Meiji 20]. In these days many of the Japanese medical doctors visited Germany to take their doctorates, and the textbooks and medical curricula reflected the influence of German medicine. The following discussion of the process of standardization of medical education and medical licenses will be divided into 4 stages.

1) Abolition of han and establishment of prefectures

In the late Edo era, many of the han introduced Dutch studies in medical education. It is reasonable to think that the widespread Dutch education in the han facilitated the rapid absorption of Western medicine in Japan after the Meiji Restoration. According to the study by Yamazaki (1955), about 26 han among the 272 han in the Edo era set up medical schools beside the ordinary schools of the han. We found that seven



Fig. 10. Seiji Morita “Kaibōgaku Kōgi” (Anatomy Lecture) in 3 vols., title page. Owned by National Diet Library.

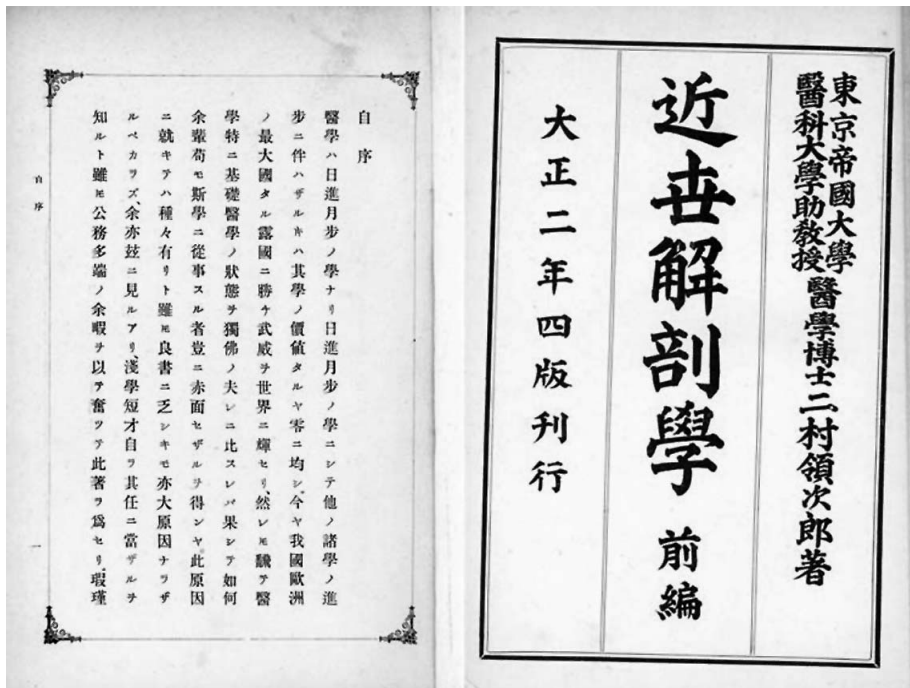


Fig. 11. Ryōjiro Futamura “Kinsei Kaibōgaku” (Modern Anatomy) in 2 vols., 4th edition, title page and preface by the author. Owned by T. Sakai.

medical schools of the han escaped notice in his study and that Meiji government established four medical schools, so that there were actually 37 medical schools in Japan at the time of the abolition of han in 1871. Many of these medical schools employed foreign teachers. Their nationalities were diverse including the Dutch, American, English and French. However, the abolition of han and establishment of prefectures in 1871 [Meiji 4] deprived the han's medical schools of their financial basis, leading to the necessity of the closing of most of these schools (Sōda et al. 1988; Kira, 2005).

2) Proclamation of school system and medical system

The Meiji government established the Gakusei (School System) in 1872 [Meiji 5], and divided the schools throughout Japan into eight large districts. At the same time seven national medical schools were planned, under the control of the Ministry of Education. However, the original plan was reduced after a year to the establishment of only two medical schools in Tokyo and Nagasaki. Furthermore, the national medical school in Nagasaki was closed in 1875 [Meiji 7], and only one national medical school survived in Tokyo, which later became the Faculty of Medicine in the University of Tokyo (Ministry of Education, 1972).

The national medical school in Tokyo originally had 300 students in a class, but in 1872 [Meiji 5] the German teacher Müller reformed the school to reduce the number of students in a class to 100 in order to educate medical students in German language. Soon after the retirement of Müller in 1875 [Meiji 8], the school created an annex course (Tsūgakusei Kyōjō, later Bekka) in order to allow the rapid education of medical students in three years under the instruction of Japanese teachers. Professor Taguchi taught anatomy in the annex class.

The Meiji government established the Isei (Medical System) in 1874 [Meiji 7] to regulate medical matters and public health. It determined the precondition for the licensing of medical practice as requiring either graduation from the faculty of medicine of the university, followed by two years of practical training, or an individual judgment based on carrier and achievements of medical practice for previous medical doctors, or as based on success in the newly introduced Examination of Medical Practice for those wished to become medical doctors. The Examination for Medical Practice was carried out from 1875 [Meiji 8] on. The seven subjects of examination were 1) physics, 2) chemistry, 3) anatomy, 4) physiology, 5) pathology, 6) pharmacy, and 7) internal medicine and surgery (Kawakami, 1965). The examination was carried out separately in the districts at first, but in 1879 [Meiji 12] the Regulation for Medical Examination was enforced to standardize the examination (Ministry of Welfare, 1976).

The number of those newly issued medical licenses in the 10 years between 1875 [Meiji 8] and 1884 [Meiji 17] was counted 3696, of which the numbers of graduates from the main and the annex course of faculty of medicine at the university were 78 (2.1%) and 285 (7.7%), respectively, the graduates from foreign medical schools 3 (0.1%), and those who succeeded in examination were 3330 (90.1%). It is notable that only 2% of the newly licensed medical doctors were educated by German teachers at the University (Higuchi, 1999) (Table 7). In addition, a greater number of licenses was issued to previous medical doctors, who amounted 35319 in 1884 [Meiji 17], representing 86.4% of the total licenses of medical doctors (Ministry of Welfare, 1976).

Table 7. The number of licensees for medical practice in Japan from 1875 [Meiji 8] to 1884 [Meiji 17]. (after Higuchi T., 1999)

Date of license	Successful in examination	Graduated from the main course in University of Tokyo	Graduated from the annex course in University of Tokyo	Graduated from foreign medical schools	Total
1875/4–1877/3	121	0	0	0	121
1877/4–1878/4	299	0	0	0	299
1878/5–1880/9	1013	6	75	0	1094
1880/10–1881/9	256	12	18	1	287
1881/10–1882/8	422	25	29	2	478
1882/9–1883/8	595	14	73	0	682
1883/9–1884/7	624	21	90	0	735
Sum total	3330	78	285	3	3696
Proportion	90.1%	2.1%	7.7%	0.1%	100.0%

3) General rules for medical schools and reform of examinations for medical practice

Medical schools in Japan, with the exception of the University, were called “Semmon Gakkō” (specialized training school) before 1882 [Meiji 15], when Igakkō Tsūsoku (general rule for medical schools) was put into effect and classified medical schools into Kō-shu (first rank) and Otsu-shu (second rank). The first rank medical schools were required 1) to employ three or more bachelors of medicine who had graduated from the University as teachers, 2) to admit those with academic ability higher than those graduating from middle school, and 3) to educate students for 4 years or longer. The second rank medical schools were required to employ at least one bachelor of medicine as a teacher and to educate the students for three years or longer. In 1884 [Meiji 17] the system of Examination for Medical Practice was reformed so that the graduates of the first rank medical schools were provided a License for Medical Practice without examination.

In 1885 [Meiji 18], there were 29 public and 2 private medical schools, according to the statistics kept by the Ministry of Education. Among them, 21 public medical schools were qualified as first rank (Itagaki, 2009). Thus, many of the bachelors of medicine who had been educated in the German language at the faculty of medicine in the university were employed in medical schools throughout Japan.

The number of those newly registered as medical doctor in the five years between 1884 (Meiji 17) and 1889 (Meiji 22) was 3753, out of which the graduates from the faculty of medicine in the university were 885 (23.6%) including the main and annex courses, the graduates from the first rank medical schools were 1154 (30.7%), those who succeeded in examination were 1707 (45.5%), and the graduates from the foreign medical schools 7 (0.2%) (Higuchi, 2001) (Table 8).

The candidate for the Examination for Medical Practice studied medicine in preparatory medical schools. In these schools the anatomy was taught mainly by lectures without dissection course to anatomize cadavers. This means that about half of the newly licensed doctors in this period did not have chance of substantial anatomy education including dissection.

4) Establishment of the Imperial University and senior middle schools

The faculty of medicine of the University of Tokyo had two courses, the main course to educate bachelors of medicine and the annex course to rapidly train medical doctors. The annex course, which was established in 1875 [Meiji 8] and educated students in 3 years originally (in 3 and a half years later), had

Table 8. The number of registrants for medical practice in Japan from 1884 [Meiji 17] to 1889 [Meiji 22]. (after Higuchi T., 2001)

Date of announcement	Successful in examination	Graduated from University of Tokyo	Graduated from other medical schools in Japan	Graduated from foreign medical schools	Total
1884/4–1885/6	92	192	95	0	379
1885/7–1886/7	235	239	195	1	670
1886/8–1887/7	344	186	282	1	813
1887/8–1888/7	307	137	342	0	786
1888/8–1889/7	729	131	240	5	1105
Sum total	1707	885	1154	7	3753
Proportion	45.5%	23.6%	30.7%	0.2%	100.0%

a full quota of 60 and admitted students two times in a year. The admission into the annex course was stopped in 1885 [Meiji 18]. In 1886 [Meiji 19], the Imperial University was established in Tokyo and the faculty of medicine became college of medicine in the Imperial University.

In 1887 (Meiji 20), the Ministry of Education established five national senior middle schools, and converted five public medical schools into the faculty of medicine in the senior middle schools. The other public medical schools suffered from the ban on financial support from the local tax, so that only the three public medical schools in Kyoto, Osaka and Aichi survived after 1888 [Meiji 21]. In 1886 [Meiji 19] there were two private medical schools of the second rank, Saisei Gakusha and Seikai Kōshūshō. The latter was unique for its medical education based on the English manner, whereas in other medical schools the medical education was carried out after the German manner (Figs. 12 and 13).

As the numbers of graduates of the first rank medical schools increased, the number of newly licensed medical doctors by examination decreased gradually. After 1891 [Meiji 24] when the faculty of medicine of the senior middle schools began to send off graduates, the number of newly licensed medical doctors by examination became smaller than that of those coming from of qualified medical schools such as national or public medical schools of the first rank.

Summary and conclusion

The modern anatomy education in Japan began in 1871 [Meiji 4] when the German teachers taught anatomy including dissection of human cadavers at the University of Tokyo. After 1877 [Meiji 10], many public medical schools were established and invited graduates of the University of Tokyo as teachers. In this period the anatomy lectures at the University of Tokyo were either recorded and published as a textbook of anatomy, or utilized as a basis of newly edited textbooks of anatomy. After 1887 [Meiji 20] the medical schools in Japan were reduced in number and the doctors were educated in the five national medical schools and three public ones in addition to the University of Tokyo. In this period illustrated substantial textbooks of anatomy were published. At the first meeting of Japanese association of anatomists in 1893 [Meiji 26], anatomy teachers in Japan came together, most of whom were either graduates of the University of Tokyo or those studied once at the department of anatomy of the university.

The present study clarified some characteristic facets in the developmental process of modern anatomy education in Japan. First, in the Meiji 10s the anatomy teachers and anatomy textbooks spread from the University of Tokyo to the medical schools in Japan as the number of medical schools increased tempo-

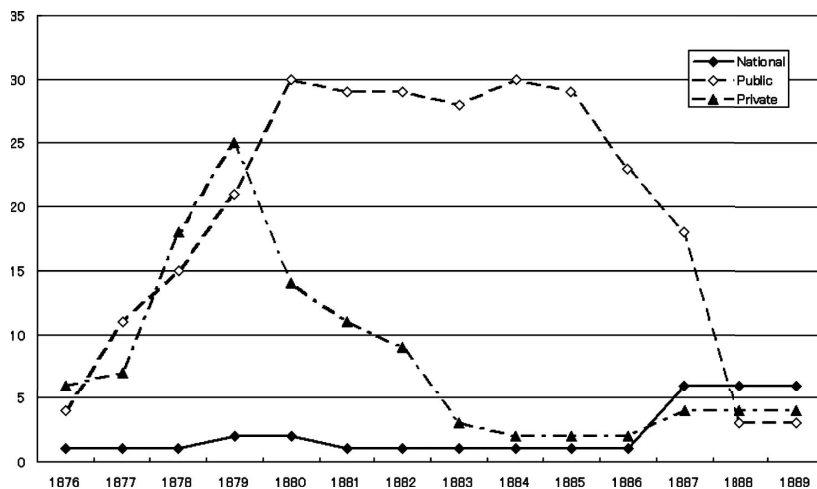


Fig. 12. Chronological change of numbers of medical schools in Japan in the early Meiji era. Created by T. Sakai, based on “Annual report of Ministry of Education” from 1876 [Meiji 9] to 1889 [Meiji 22].

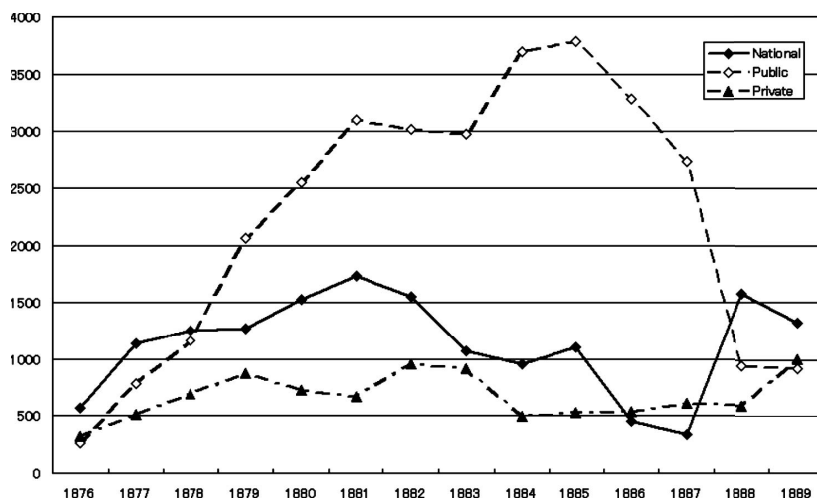


Fig. 13. Chronological change of numbers of medical students in Japan in the early Meiji era. Created by T. Sakai, based on “Annual report of Ministry of Education” from 1876 [Meiji 9] to 1889 [Meiji 22].

rally. Second, in the Meiji 20s the five national and three public medical schools in addition to the University of Tokyo provided substantial anatomy education including dissection course. Third, even in the early Meiji 20s these medical schools supplied only half of the newly licensed doctors, and the others were supplied through the national examination after preparatory education at private medical schools without opportunity of substantial anatomy education including dissection course.

Notes

- 1) The present article is a revised translation of a Japanese article entitled “Historical evolution of the modern anatomy education in Japan” appeared in *Acta Anatomica Nipponica*, vol. 83, pp. 105–116, 2008.

References

- Granger N. A. Dissection laboratory is vital to medical gross anatomy education. *Anat Rec.* 2004; 281B: 6–8.
- Higuchi T. On the examination for medical practice by Ministry of Home Affairs from Meiji 8 to 16. Source data at the 100th annual congress of Japan Society of Medical History; 1999. (in Japanese)
- Higuchi T. Registrants in the medical register from Meiji 17 to 21. Source data at the 102nd annual congress of Japan Society of Medical History; 2001. (in Japanese)
- Ishibashi C., Ogawa T. *Oyatoi gaikokujin. vol. 9, Medicine.* Tokyo: Kajima Institute Publishing; 1969. (in Japanese)
- Ishibashi C., Ogawa T., Imai T. (tr). Müller: *Tokyo-Igaku.* Tokyo: International Medical Society of Japan; 1975. (in Japanese)
- Itagaki E. Studies on the medical education in Ishikawa the first medical school. An evaluation of the medical education based on the text books and the reference books for medicine. *Nihon-Kaiiki Kenkyū.* 2009; 40: 91–103. (in Japanese)
- Iwaji Y. Data of medical study by Matsumura Noriaki, Western medical doctor in Ohno Han. *Teiitsu Shiryō.* 1992; 20: 4–12. (in Japanese)
- Japan Academy (ed). *Japanese medical history before Meiji era. vol. 1.* Tokyo: Japan Society for the Promotion of Science; 1955. (in Japanese)
- Japanese Association of Anatomists, Centennial Project (ed). *A hundred years progress of Japanese Association of Anatomists.* Tokyo: Japanese Association of Anatomists; 1995. (in Japanese)
- Kanazawa University, Editorial Board for the Centennial History of Faculty of Medicine (ed). *Centennial History of Faculty of Medicine, Kanazawa University.* Kanazawa: Centennial Memorial Committee of Faculty of Medicine, Kanazawa University; 1972. (in Japanese)
- Kawakami T. *History of medical care in modern Japan.* Tokyo: Keisō Shobō; 1965. (in Japanese)
- Kira S. *Western medicine from end of Shogunate to abolition of han.* Tokyo: Tsukiji Shokan; 2005. (in Japanese)
- Kitakawabe-chō, Research Society for Dr. Taguchi Kazuyoshi (ed). *Medical doctor Taguchi Kazuyoshi, father of anatomy in Japan.* Kitakawabe-chō: Board of Education at Kitakawabe-chō; 2005. (in Japanese)
- Korf H. W., Wicht H., Snipes R. L., Timmermans J. P., Paulsen F., Rune G., Baumgart-Vogt E. The dissection course — necessary and indispensable for teaching anatomy to medical students. *Ann Anat.* 2008; 190: 16–22.
- McLachlan J. C. New path for teaching anatomy: Living anatomy and medical imaging vs. dissection. *Anat Rec.* 2004; 281B: 4–5.
- Ministry of Education. *Centennial history of school system.* Tokyo: Teikoku Chiho Gyosei Gakkai; 1972. (in Japanese)
- Ministry of Welfare, Bureau of Medicine (ed). *Centennial history of medical system.* Tokyo: Gyōsei; 1976. (in Japanese)
- Miyanaga T. *Pompe — the father of modern medicine in Japan.* Tokyo: Chikuma Shobō; 1985. (in Japanese)
- Müller L. *Tokyo-Igaku. Skizzen und Erinnerungen aus der Zeit des geistigen Umschwungs in Japan, 1871–1876.* Deutsche Rundschau. 1888; 57: 312–329, 441–459.
- Nagasaki University, Faculty of Medicine. *Centennial history of medicine in Nagasaki.* Nagasaki: Faculty of Medicine, Nagasaki University; 1961. (in Japanese)
- Narasaka G. *Complete biography of Narasaka Gen'ichirō, an anatomist.* Funabashi: Narasaka Genjirō; 2004. (in Japanese)
- Numata J., Arase S. (tr). *Pompe's experience report during stay in Japan.* Tokyo: Yūshōdō Shoten; 1968. (in Japanese)
- Schmid R. Who was Disse? *Hematology.* 1991; 14: 1283–1285.
- Shimada K. Anatomy books early in Meiji era, the first lecture record of anatomy — on “Nikkō Kimon, Tokyo Igaku Ika Zensho Kaibō-hen”. *Keitai Kagaku.* 2006; 9: 43–47, 49–52. (in Japanese)
- Shinohara K. Contribution of Wilhelm Dönitz on the study of Japanese fauna and zoologists among them. *Bull Metropol Kasai High School.* 1995; 15: 15–29. (in Japanese)
- Sōda H., Kambara H., Nagatoya Y., Ishida S. (ed). *Modernization in medicine and foreigners coming to Japan.* Osaka: Sekai Hoken Tsūshin-sha; 1988. (in Japanese)
- University of Tokyo, Memorial committee for a hundred anniversary of Faculty of Medicine, (ed). *Centennial history of Faculty of Medicine, University of Tokyo.* Tokyo: University of Tokyo Press; 1967. (in Japanese)
- Wittermans E. P., Bowers J. Z. (tr). *Doctor on Desima. Selected chapters from JHR J. L. C. Pompe van Meerdervoort's Vijf Jaren in Japan [five years in Japan] (1857–1863).* Tokyo: Sophia University; 1970.
- Yamazaki T. *Prospect of medical education in the individual han.* Tokyo: Kokudo-sha; 1955. (in Japanese)
- Yoshioka T. Pioneer of Japanese anatomists — Imada Tsukanu. *Rep Med Assoc Yamaguchi Pref.* 2004; 1717: 27. (in Japanese)