Legendary Thoracic Surgery: The Birth of China' s First Esophageal Cancer Resection and Reconstruction Surgery at Peking Union Medical College Hospital (Postprint)

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Abstract

In the 1940s, Professors Wu Yingkai and Lou Kesi at Peking Union Medical College Hospital established a multidisciplinary collaborative research group for esophageal cancer, pioneering the earliest explorations in esophageal cancer surgical treatment in China. This article reviews the entire course and historical significance of China' s first esophagectomy and reconstruction procedure performed at Peking Union Medical College Hospital, summarizes the perioperative management experience from the early esophageal cancer surgical practice of Professors Wu Yingkai and Lou Kesi, and outlines the optimization proposals they advanced for esophageal anastomosis techniques.

Full Text

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A Legend in Thoracic Surgery: The Birth of China's First Esophageal Cancer Resection and Reconstruction Surgery at PUMCH

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Abstract

In the 1940s, Y.K. Wu and H.H. Loucks established a multidisciplinary cooperative research group on esophageal cancer at Peking Union Medical College Hospital (PUMCH), launching the earliest exploration of surgical treatment for esophageal cancer in China. This paper reviews the experience and historical significance of the first esophageal cancer resection and reconstruction operation in China, performed at PUMCH, and summarizes Wu and Loucks' experience in perioperative management of esophageal cancer surgery and their proposed optimizations for esophageal anastomosis techniques.

Keywords: esophageal cancer; Y.K. Wu; H.H. Loucks; PUMCH

Introduction

Esophageal surgery has evolved significantly and remains the established first-line treatment for esophageal cancer, particularly in early-stage patients[1]. In 1938, Phemister, Adams, and Samuel Marshall nearly simultaneously achieved the world' s first successful esophageal cancer resections with esophagogastrostomy[2-3], marking a breakthrough milestone in esophageal surgical therapy. In China, Professor Y.K. Wu, under the guidance of H.H. Loucks, then Chief of Surgery at PUMCH, successfully performed the first such operation, laying the foundation for the development of esophageal cancer surgery in China.

Professor Wu Ying-kai graduated from Shenyang Xiaohéyan Medical College in 1933 and joined PUMCH as a resident physician and lecturer. After progressing through various training stages, Wu was selected by Professor Loucks in 1939 to join the multidisciplinary esophageal cancer research group, which comprised elite physicians from surgery, radiology, and otolaryngology departments. Esophageal cancer exhibited high incidence rates in China, accounting for 27.2% of gastrointestinal tumors seen at PUMCH. Under the leadership of then Chief of Surgery Adrian Taylor, Dr. Songtao Wu attempted the first surgical resection in 1937, but the patient died one and a half years postoperatively[10]. Due to limited experience, early attempts at esophageal cancer resection at PUMCH yielded no long-term survivors, primarily because of severe postoperative infections and tumor recurrence. Palliative procedures such as gastrostomy could not achieve radical tumor removal or restore normal digestive physiology, leaving patients to endure only a few months of painful existence.

The First Esophageal Resection and Reconstruction

On a December morning in 1940, Wu Ying-kai led his surgical team to begin China' s first esophageal cancer resection with gastric reconstruction. The first assistant was Fan Lecheng, Chief Surgical Resident. Anesthesia was administered by Dr. Ma Yueqing using standard endotracheal intubation with positive-pressure inhalation anesthesia. The multidisciplinary esophageal cancer research

group had formulated a comprehensive surgical plan based on lessons learned from previous American cases. The procedure employed a left thoracoabdominal approach, selecting a high left rectus incision extended along the superior margin of the eighth rib to the posterior axillary line for optimal exposure.

Intra-abdominal exploration revealed the tumor located in the abdominal segment of the esophagus below the esophageal hiatus, involving the gastric cardia but not the gastric fundus. The tumor was not densely adherent to surrounding tissues, and only a few palpable abdominal lymph nodes were present around the tumor. After dividing adhesions between the lung and diaphragm, the diaphragm was opened completely toward the esophageal hiatus, connecting the thoracic and abdominal cavities. Thoracic exploration showed a tumor involving the lower esophagus measuring 5 cm × 6 cm, with mild adhesion to the mediastinal pleura. Both vagus nerves were densely adherent to the tumor. Positive-pressure ventilation on the right side resulted in a right pneumothorax due to pleural injury, which was repaired.

The left gastric artery within the hepatogastric ligament and the short gastric arteries within the gastrosplenic ligament were identified, ligated, and divided. After this mobilization, the stomach could be easily transposed into the thoracic cavity. The gastric body was transected obliquely along the lesser curvature and gastric fundus using a suture device. The distal gastric stump was closed with interrupted seromuscular sutures. The esophagus was transected 5 cm distal to the tumor, completely removing the esophageal tumor and gastric cardia. An end-to-side esophagogastric anastomosis was then performed, anchoring the posterior esophageal wall to the gastric fundus. The anterior layer was closed with interrupted silk sutures, followed by a second layer of seromuscular and partial mucosal sutures. The thoracic stomach was further anchored to the diaphragm to prevent postoperative gastric volvulus[Figure 1: see original paper].

Patient Presentation and Preoperative Management

The patient was a Chinese male who presented to the surgical outpatient clinic with dysphagia, particularly for solid foods, accompanied by left upper abdominal pain and gastric reflux. Gastrointestinal contrast study revealed irregular thickening of the lower esophageal and cardia walls. Esophagoscopy demonstrated an esophageal mass 38 cm from the incisors, with biopsy confirming esophageal squamous cell carcinoma. Preoperative nutritional support was established through placement of a jejunostomy tube by Dr. B.H.Y. Tang in the tuberculosis clinic. Because the tumor location was amenable to surgical resection, Professor Loucks decided to perform China' s first esophageal cancer resection with gastric reconstruction together with Wu Ying-kai.

However, on the morning of surgery, Professor Loucks was severely ill with a cold and could not operate. Wu Ying-kai called him from the hospital for guidance. Despite Wu' s concerns about the patient' s tolerance and potential anastomotic leakage given the lengthy procedure, Professor Loucks encouraged him: "Go

on, Ying-Kai, since the patient is ready. I am sure you can do the job. I wish you all the best." The operation proceeded smoothly under stable anesthesia, and Wu successfully completed the resection and double-layer esophagogastric anastomosis below the aortic arch.

Postoperative Course and Outcomes

Postoperatively, the patient received sulfonamide for infection prophylaxis. The left thoracic drainage tube was maintained on continuous negative suction, draining 200 ml of serosanguineous fluid daily. Jejunal feeding was administered for nutritional support. On postoperative day 5, the patient developed fever to 39.2°C, but no anastomotic leakage or other serious complications occurred. The thoracic drainage tube was removed on day 7 when drainage decreased to less than 50 ml within 24 hours. Chest radiography confirmed good lung re-expansion. Skin sutures were removed, though two soft tissue areas of the thoracoabdominal incision required additional management before complete healing.

The patient received jejunal nutrition for 2 weeks, then began oral intake with liquids, transitioning to semi-solid foods after 3 weeks. The jejunostomy tube was removed on day 21. One and a half months postoperatively, the patient had gained 5 kg, with normal three-meals-per-day intake and no dysphagia, though complaining of postprandial retrosternal fullness. Follow-up gastrointestinal contrast study at 3 weeks showed patent anastomosis without leakage. Pathology confirmed lower esophageal squamous cell carcinoma invading the gastric cardia with metastatic lymph nodes nearby[Figure 12: see original paper].

Wu Ying-kai' s Six-Point Summary of Surgical Experience

Wu Ying-kai analyzed and summarized six key points from this experience:

1. **Preoperative Nutrition:** The patient' s preoperative nutritional status and degree of weight loss are closely related to postoperative anastomotic healing. Poor nutrition is a major cause of anastomotic leakage. Nutritional status should be actively improved preoperatively.
2. **Surgical Exposure:** Adequate thoracic exposure is crucial for precise surgical manipulation. Creating an artificial left pneumothorax can facilitate this exposure.
3. **Oncologic Principles:** Sufficient distance between the esophageal transection margin and tumor tissue is essential to reduce operative time and anastomotic leakage risk.
4. **Combined Procedures:** Performing abdominal exploration and jejunostomy beforehand can reduce operative time.
5. **Anastomotic Protection:** Covering the gastroesophageal suture line with mediastinal pleura or omentum may reduce intraoperative contami-

nation and postoperative infection. Tension on the anastomosis should be minimized to prevent ischemia and leakage.

6. **Technical Refinements:** The esophageal wall lacks a serosal layer, making anastomosis challenging. Surgeons must be familiar with esophageal anatomy and physiology to improve outcomes.

Historical Significance and Legacy

The surgical mortality rate for this case was 27.2%, compared to approximately 39.2% internationally at that time. The patient recovered well, validating the "beginner' s luck" proverb that was jokingly invoked in the operating room when Dr. Fan Lecheng suggested a bet on the patient's recovery. Wu Ying-kai honored his promise by hosting the surgical team at a banquet costing one-third of his monthly salary at the Lumingchun Restaurant.

Between 1940 and 1941, the multidisciplinary esophageal cancer group led by Loucks and Wu completed 10 cases. Wu compiled these valuable academic materials and co-authored publications with Professor Loucks in *The American Journal of Surgery* and the *Chinese Medical Journal*[11], drawing international attention from thoracic surgeons worldwide. During his fellowship at Barnes Hospital, Washington University School of Medicine in St. Louis, Wu was invited to present China' s valuable experience in esophageal cancer surgery at the St. Louis Surgical Society, where he met with Dr. Evarts A. Graham, who was also developing esophageal resection techniques[Figure 3: see original paper].

Conclusion

The pioneering work of Loucks and Wu in esophageal cancer resection, though based on limited cases, identified key factors related to anastomotic leakage, including esophageal anatomical characteristics, anastomotic tension, blood supply, and reconstruction methods. Their foresighted and innovative concepts laid the foundation for the development of esophageal cancer surgery at PUMCH in the 1940s and made outstanding contributions to the field. While esophageal cancer surgery has undergone revolutionary advancements and anastomotic techniques have been refined, anastomotic leakage remains a persistent challenge, with many centers still reporting incidence rates of 10-20%[12]. The meticulous attention to operative details and perioperative nutritional management demonstrated by early PUMCH surgeons continues to hold valuable lessons for contemporary practice.

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Figure Legends

[Figure 1: see original paper] Key steps of esophagogastric reconstruction in this case[5]
[Figure 3: see original paper] Photograph of thoracic surgeons at Barnes Hospital, Washington University School of Medicine, with Professor Graham (first from left is Wu Ying-kai)[10]
[Figure 12: see original paper] Postoperative paraffin pathology of this case: A. Ulcerative esophageal carcinoma; B. Microscopic specimen photograph, with original paraffin pathology report at bottom left[5]

Note: Figure translations are in progress. See original paper for figures.