

Dr Stuart Harrington: Historical challenges and success in pericardiectomy



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Dr Stuart W. Harrington (Figure 1) was among a small group of thoracic surgeons who pioneered pericardiectomy for constrictive pericarditis. Dr Harrington was born on April 20, 1889, to Jeanette Dunsmore Harrington and John C. Harrington in Blossburg, Pennsylvania.¹ After 1 year of premedical studies at Pennsylvania State College, he attended the University of Pennsylvania where he was well known for balancing his medical studies with a notable football career.¹ In 1912, he was elected as a halfback to the Walter D. Camp All-American Team and in 1913 obtained his Doctor of Medicine degree, accomplishments especially impressive as he worked part-time jobs to support himself financially through school.² After a 1-year internship at Howard Hospital in Philadelphia, Dr Harrington completed his surgical fellowship at Mayo Clinic in Rochester, Minnesota, and received a Master of Science degree from the University of Minnesota. He then joined Mayo Clinic as head of a section of surgery in 1920 and remained on the surgical staff until 1954.^{1,2}

During his early career, he had a special interest in gastrointestinal and urologic surgery but was later persuaded by Dr William J. Mayo to focus on thoracic and breast surgery.^{1,2} To expand his education in chest surgery, he visited notable thoracic surgeons of the day, including Dr Evarts Graham, Dr John Alexander, Dr Peter Churchill, and Dr Ferdinand Sauerbruch.² In 1937, Dr Harrington was elected President of The American Association for Thoracic Surgery.²

Dr Harrington made important contributions to many areas of thoracic surgery, including the surgical treatment of chronic postpneumonic empyemas, diaphragmatic hernias, mediastinal tumors, and diseases of the esophagus. He pioneered the one-stage resection of pharyngoesophageal diverticula.^{1,2} Less well-known is his interest in operation for chronic constrictive pericarditis, which may have



Stuart W. Harrington, MD, 1889-1975

CENTRAL MESSAGE

Dr Stuart W. Harrington was a pioneer of the surgical treatment of constrictive pericarditis and his contributions remain relevant to current practice.

PERSPECTIVE

This Young Surgeon's Note provides trainees with an overview of Dr Stuart Harrington's contributions to our current knowledge and surgical approach to pericardiectomy. We describe Dr Harrington's impressive in-depth understanding of constrictive pericarditis and exceptional surgical skills despite the slow evolution of cardiac surgery up to 1940.

been stimulated by his contact with Dr Sauerbruch. But beyond Harrington's description of the method of cardiac decortication was a remarkable understanding of the clinical presentation and pathophysiology of constrictive pericarditis.²⁻⁴

In the 20th century, surgical treatment of chronic constrictive pericarditis evolved beyond removing several ribs and costal cartilages on the left side of the precordium, to "cardiolysis" as proposed by Weil and Delorme.⁴ Although Dr Sauerbruch resected a portion of the pericardium in 1913, the first pericardiectomy is usually attributed to Dr Wilhelm Rehn in 1920. A number of reports of successful pericardiectomies followed from surgeons in Europe and the United States.⁵

Constrictive pericarditis remains an important cause of diastolic heart failure because, in contrast to other etiologies

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FIGURE 1. Stuart W. Harrington, MD, 1889-1975. Used with permission of Mayo Foundation for Medical Education and Research. All rights reserved.

that are primarily myocardial abnormalities and difficult to manage, constrictive pericarditis can be cured in many patients by operation. As seen in [Figure 2](#), a total of 1472 pericardiectomies for constrictive pericarditis have been performed at our Clinic since 1936, and 43 of these procedures were performed during Dr Harrington's tenure as a staff surgeon. During the last 3 decades, the 30-day postoperative mortality rate has decreased from 6.7% to 2.8%.

SURGICAL TECHNIQUE OF PERICARDIECTOMY

Dr Harrington's surgical technique for pericardiectomy ([Figure 3](#)) included an initial U-shaped skin incision, dissection of muscles, costal cartilages of third to sixth

ribs, and a few centimeters of the corresponding ribs, followed by harvesting of an intercostal muscle flap and ligation of intercostal vessels. Then, pericardial attachments to the sternum were separated and, in some cases, the left half of the sternum was resected. Dissection of the pleura from the pericardium followed, and he cautioned against complications such as inadvertent openings of the pleura and subsequent pulmonary collapse. Afterward, the pericardium and epicardium were meticulously separated from the myocardium, with special attention to avoiding injury to the left coronary vessels and heart muscle. He recommended freeing the left ventricle first, although he initially freed the right ventricle in many cases. He further described dissecting pleural attachments to the pericardium over to the left phrenic nerve and cautioned against attempting to remove calcified tissue that invaded the myocardium. Importantly, Dr Harrington advocated separating as much of the pericardial scar as feasible.^{3,4} Indeed, Dr Harrington recognized the importance of completeness of pericardial resection, and he wrote, "Opinions differ concerning the amount of pericardial scar that it is necessary to remove as well as concerning the amount of scar to be separated from the heart muscle and from the orifice of the inferior vena cava. I believe it is advisable to separate as much of the pericardial scar as possible from the ventricles, the right auricle, and orifice of the inferior vena cava and it is of particular importance to separate the attachment of the right ventricle to the diaphragm."³

Considering the slow evolution of cardiac surgery up to 1940, Dr Harrington's ability to perform such an extensive procedure at the time is remarkable. His tools were limited as he used blunt and sharp dissection with suture control of bleeding. Procedures were performed without the assistance of experienced cardiac anesthesiologists. Indeed, he wrote that early cases were done with positive pressure mask ventilation, but he subsequently advised the use of endotracheal intubation.³ Further, Dr Harrington did not

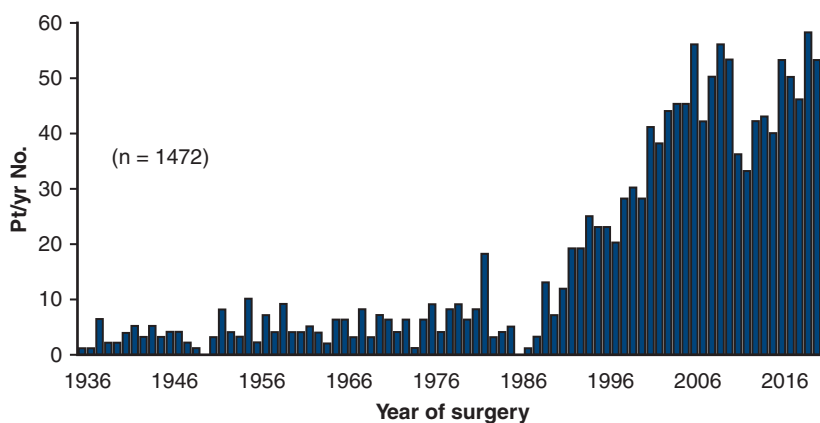


FIGURE 2. Pericardiectomy for constrictive pericarditis at Mayo Clinic, 1936-2021.

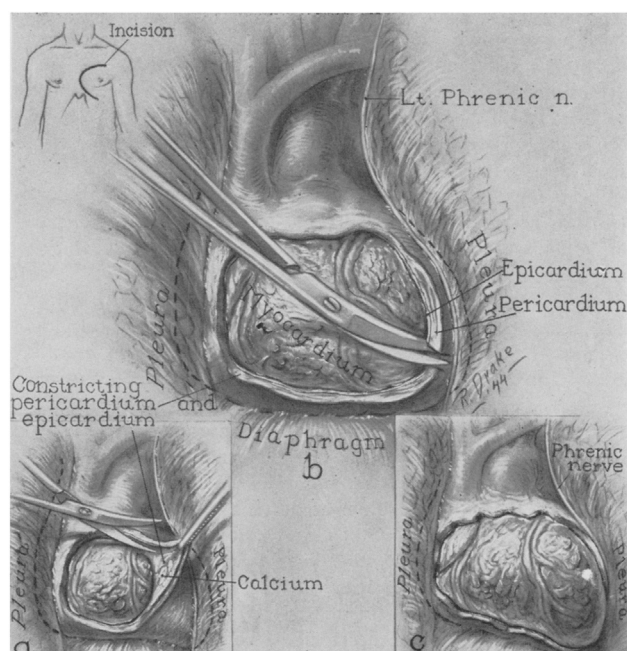


FIGURE 3. Dr Harrington's technique for pericardiectomy. Reprinted with permission.³

have (and probably could not have imagined) the safety net of cardiopulmonary bypass and the cardiopulmonary support available in today's intensive care units.

In current practice, surgeons most often use median sternotomy or left anterolateral thoracotomy to perform pericardiectomy for constrictive pericarditis.⁶ Tools include liberal use of electrocautery, access to cardiopulmonary bypass for hemodynamic support when necessary, and monitoring with arterial and pulmonary artery catheters as well as transesophageal echocardiography, which may identify associated valve pathology, especially tricuspid valve regurgitation and unexpected ventricular dysfunction.⁷ Considerable data are available to support the removal of as much pericardium as possible as the completeness of pericardiectomy is associated with increased survival compared to partial pericardiectomy.⁸ Nonetheless, despite the important technological and technical advancements in cardiac surgical practice, surgeons who perform pericardiectomy nowadays continue to follow many of the same principles described by Dr Harrington.

PATHOGENESIS AND DIAGNOSIS OF CHRONIC PERICARDITIS

Despite important progress in surgical treatment, the pathophysiology and important diagnostic features of constrictive pericarditis were not widely known during Dr Harrington's career. Forty years earlier, Dr Pick recognized a relationship between pericardial disease and polyserositis

and pseudo-cirrhosis.⁹ In 1940, Drs Harrington and Barnes published a comprehensive and extremely detailed case series of 9 patients with chronic constrictive pericarditis treated with pericardiectomy (Figure E1). They described constrictive pericarditis as an extrinsic mechanical condition that interferes with diastolic filling of the heart and therefore "relief can be obtained only by surgical treatment."⁴ Dr Harrington further simplified the pathophysiologic issue as "an inflow stasis of gradual increasing severity," and he reviewed the progression of insidious symptoms and signs including dyspnea on exertion that is relieved by rest, ascites, pulsating or distended veins, hepatomegaly, edema of the legs, cyanosis, faint heart sounds, low blood and pulse pressure, and "digestive disturbance" such as anorexia, epigastric distress, and postprandial abdominal fullness. Notable too is his recognition of impaired left ventricular systolic function after pericardiectomy that can develop in some cases due to associated myocardial atrophy and degeneration, a phenomenon later confirmed in animal experiments.^{4,10}

Dr Harrington used arm-to-tongue circulation time and bromsulfalein hepatic function tests to determine the severity of the disease and to differentiate constriction from liver cirrhosis. He concluded "that impairment of hepatic function plays a crucial role in the patient's postoperative reaction and that preoperative attempts to improve hepatic function are highly important," as he understood the consequences of persistent increased venous pressure due to diastolic heart failure.^{3,4} Today, it is widely recognized that early and late outcomes of pericardiectomy are related to preoperative hepatic reserve.¹¹ This led to Dr Harrington's emphasis on the importance of early diagnosis and timely surgical intervention.³ Indeed, early surgical intervention in appropriate patients is associated with improved outcomes.⁶

In both of Dr Harrington's papers on pericardiectomy he discussed etiologies of constrictive pericarditis and stated that there was no identifiable cause in most patients. However, he noted that some patients had preceding recurrent episodes of pneumonia and tuberculosis, the latter currently representing 38%-83% of cases in developing countries.⁸ He also detailed expected laboratory and imaging studies results, emphasizing suggestive electrocardiographic changes and findings on radiographs of the chest, in particular, "calcareous plaques in the pericardium."^{3,4}

In his second report on pericardiectomy for chronic constrictive pericarditis, Dr Harrington updated his series including 24 patients and made the important point of recognizing epicardial constriction. He introduced the term "epicardiolysis" as "the separation of the innermost layer of the pericardium from the heart muscle."³ Recognizing and treating epicardial constriction is essential in performing an adequate pericardiectomy.⁶

CONCLUSIONS

Dr Harrington's understanding of the physiologic consequences of an externally constricted heart and his pioneering efforts at pericardiectomy are exceptional. He continued to perform the procedure in his later career but had no further publications on the subject.

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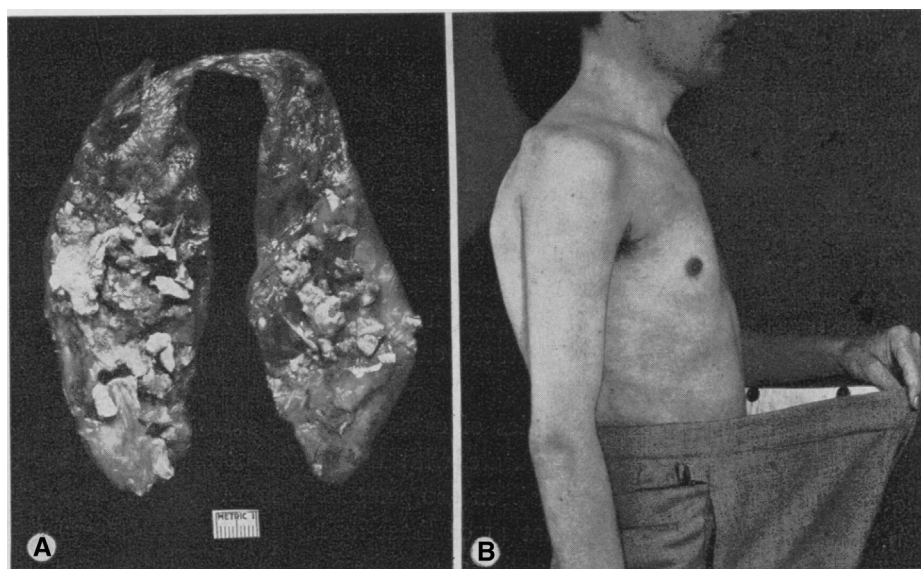


FIGURE E1. Photograph of Dr Harrington's patient after pericardiectomy showing the resected pericardium (A) and dramatic improvement of ascites (B). Reprinted with permission.³