J.F. Howell, M.D.

FOUR DECADES OF CLINICAL EXPERIENCE

JIMMY F. HOWELL, M.D.

Adapted by William L. Winters Jr., M.D., from a monograph published by Baylor College of Medicine in 2009

Baylor College of Medicine, Houston, Texas

Foreward

This compilation presents a unique look at the first 40 years of the career of a remarkable cardiovascular surgeon. One who has refined surgical skills to an unparalleled degree in addressing whatever different surgical challenges he might encounter in the course of his work. He has maintained a meticulous and comprehensive record of his surgical experience, which stands as a tribute to him, to the surgical standards he set and to which he adhered. As one of many of his cardiology colleagues, I feel privileged to have known and worked with him — as fine a person and physician as I have ever met.

Jimmy Frank Howell, known to The Methodist Hospital community simply as "Jimmy," was trained in cardiovascular surgery under the watchful eye of Dr. Michael E. DeBakey, whose strict discipline and adherence to a high standard of excellence shaped the entire career of Dr. Howell. He accepted an invitation to join Dr. DeBakey on completion of his training and very quickly developed his own surgical following.

One of my criteria for assessing the skill of a surgeon is to query nurses in the operating room, intensive care unit, and the surgical floors. "Still the best hands and judgment around," is the inevitable assessment I hear. We all will look back on a career of the remarkable, the Howells and others, with awe, appreciation, and respect. I know you will enjoy and appreciate reading about the career of a remarkable surgeon — Dr. Jimmy Frank Howell.

William L. Winters Jr., M.D.
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Every generation has its heroes. Dr. Jimmy Howell vigorously participated in the surge of interest and the spectacular growth of cardiac and vascular surgery during the DeBakey era and went on to establish himself as one of the most accomplished and prolific clinical surgeons of his generation. This text is an important addition to the medical and surgical literature in that it chronicles one of the truly remarkable individuals in the history of cardiac surgery. In addition to active participation in the explosion of cardiovascular surgery — with its technological advances including coronary bypass, management of aneurysmal and peripheral vascular disease, carotid endarterectomy, valve, pacemaker, heart/lung technology and many more — Dr. Howell contributed to the education, over decades, of generations of future cardiothoracic and vascular surgeons. His commitment to excellence across four decades of surgical practice is beyond reproach as evidenced by the outstanding clinical results chronicled on the following pages. Despite his voluminous surgical schedule and clinical activities, he always has and still manages to devote the individual attention and care that each patient deserves. In his personal life, he is a dedicated family man in his roles as husband, father, and grandfather. To this day, Dr. Howell continues to draw on his wealth of experiences to provide his patients with the highest quality surgical care. We all remain enormously grateful to these pioneers who provided the foundation for our specialty and for their careers in cardiac surgery that will never be duplicated.

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This issue of the *Methodist DeBakey Cardiovascular Journal (MDCVJ)* contains a tribute to Dr. Jimmy Howell in the form a description of his immense cardiovascular experience. Cardiovascular surgery at The Methodist Hospital was led for many years by Dr. Michael E. DeBakey who is justly remembered by many as the father of cardiovascular surgery. While many are familiar with Dr. DeBakey's technical skills and achievements as a surgeon, fewer people are aware of his keen incite into recognizing and fostering surgical talent. Dr. Jimmy Howell was one of those surgeons recognized and chosen by Dr. DeBakey to participate as one of his early partners in developing cardiovascular surgery at Methodist. The work of Dr. DeBakey, Dr. Howell and others placed Methodist on the world map as a center for cardiovascular surgery. That legacy has been passed down to shape the Methodist DeBakey Heart & Vascular Center where Dr. Howell has spent his entire career. I had the singular privilege to have Dr. Howell as one of my teachers and personally stand in awe of his stellar career. Indeed, at the *MDCVJ*, we are both extremely proud and honored to recognize Dr. Howell's many contributions to the growth of our center and recognize his importance in shaping its future.

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Introduction

For decades, Baylor College of Medicine's Department of Surgery, chaired by Dr. Michael E. DeBakey, has led the way in developing treatments for cardiac and vascular diseases (Figures 1, 2). This document, presents the personal surgical results of Jimmy F. Howell, M.D., who over the course of 40 years has performed more than 27,500 cardiac or vascular procedures excluding general and thoracic surgical opportunities. To this day, now six years beyond the scope of this report, he maintains an active surgical schedule albeit at a lesser pace (Figures 3, 4). This impressive volume of work was conducted at The Methodist Hospital, known for its excellence in the treatment of cardiac and vascular diseases — where the origins of modern vascular surgery came alive with the pioneering abdominal aorta and carotid artery operations performed by Dr. DeBakey in the early 1950s. The majority of Dr. Howell's surgical procedures were performed during the late 1970s to early 1990s, the formative years of cardiac and vascular surgery at Baylor College of Medicine and The Methodist Hospital (Figures 5, 6).

Acquired heart disease accounted for 43% of patients in this cardiovascular series. Coronary artery bypass (CABG) operations were the most common procedures. This was due in part to the pioneering work conducted by the cardiovascular surgeons at Baylor College of Medicine and The Methodist Hospital in the early 1960s, including the first successful bypass operation performed by Harvey E. Garrett, M.D. with the assistance of Jimmy F. Howell, M.D. in 1964 with encouragement and support of Dr. DeBakey (Figure 7). Their work, and the work of others at the Cleveland Clinic Foundation, established the basis for what is now the most frequently performed heart operation in the world.

Figure 1. Michael E. DeBakey, M.D.

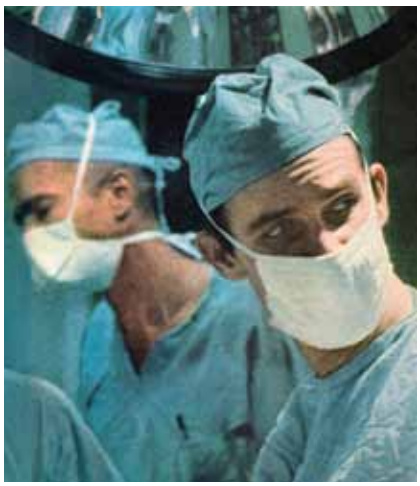


Figure 2. Jimmy E. Howell, M.D.

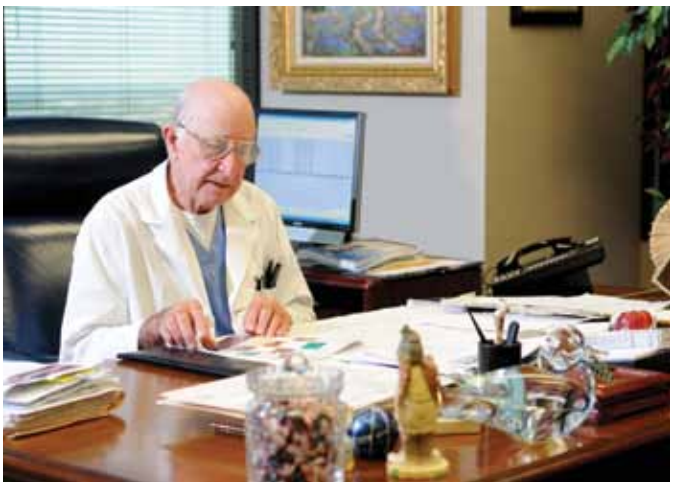


Figure 3. Jimmy E. Howell, M.D.

Figure 4. Jimmy E. Howell, M.D.

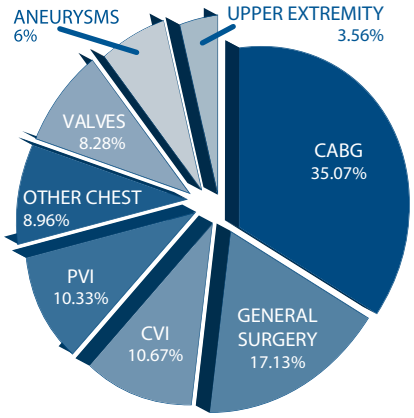


Figure 5. Surgical procedures

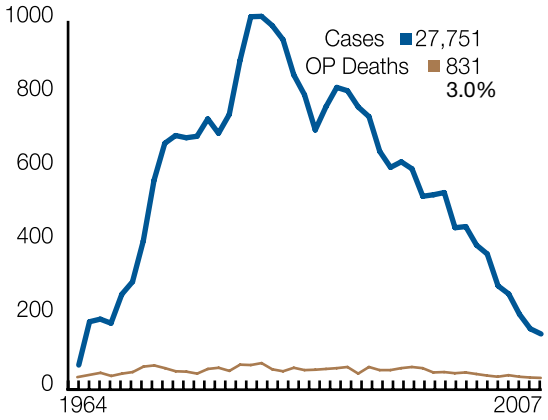


Figure 6. Total cases by year

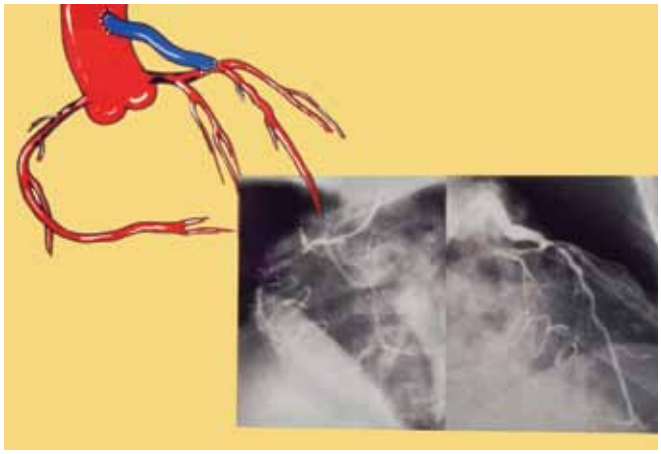


Figure 7. 7-year follow-up of the still-functioning bypass graft from the first successful coronary artery bypass by Drs. Garrett and Howell at The Methodist Hospital in 1964.

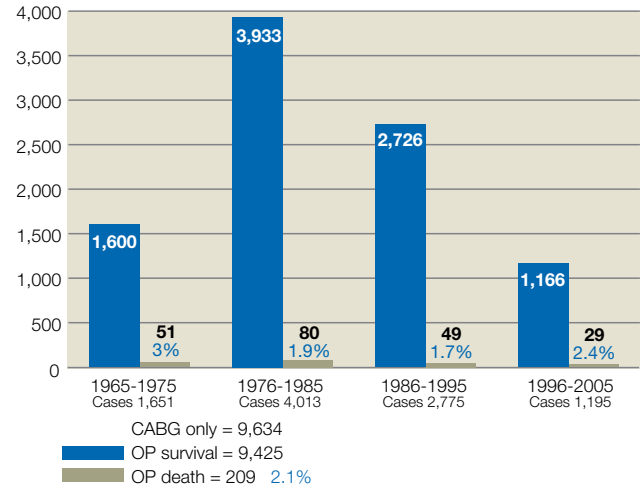


Figure 8. CABG only; STS benchmark 2002 = 5%, 2006 = 4%

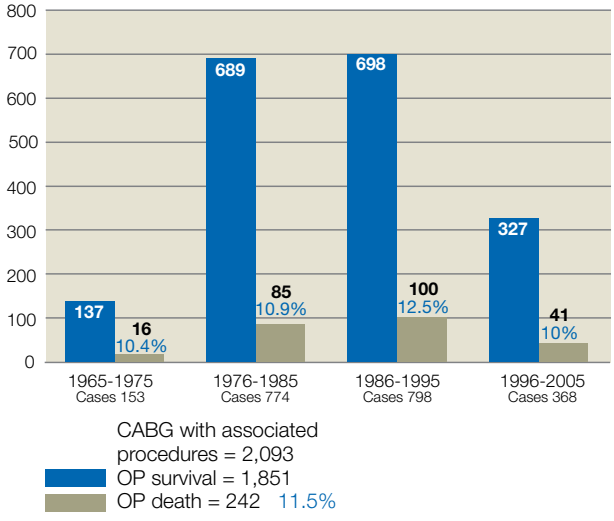


Figure 9. CABG with associated procedures

Primary Coronary Artery Bypass

Dr. Howell performed 9,634 primary coronary artery bypass procedures. There were 9,425 survivors and 209 30-day operative deaths for a 30-day mortality of 2.1% (Figure 8). During the second and third decades of Dr. Howell's practice, the mortality rate for his patients ranged between 1.7 and 1.9%, well below the national STS benchmark of 2.6%. The mortality for isolated CAB in the fourth decade was 2.4%, a slight increase from the previous three decades attributed to increased complexity of the cases.

Coronary Artery Bypass with Associated Procedures

Coronary artery bypass combined with other major surgical operations comprised 2,093 cases in this series (Figure 9). The most common additional procedures were valve replacement or repair, carotid artery recon-

Figure 10. Multi-vessel reconstruction employing bilateral internal thoracic artery and venous grafts.

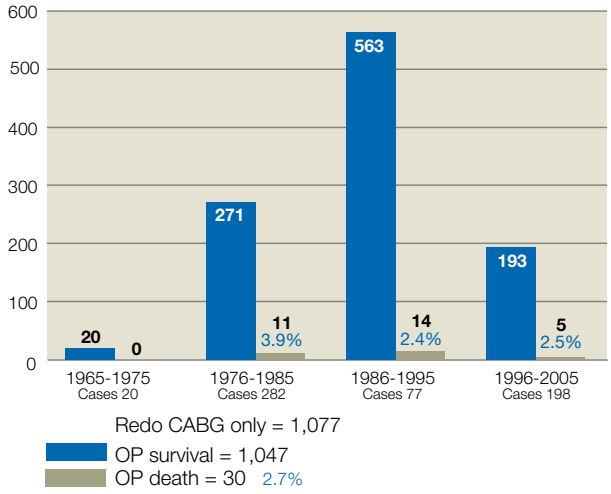


Figure 11. Redo CABG only; STS benchmark 2002 = 5%; 2006 = 4%

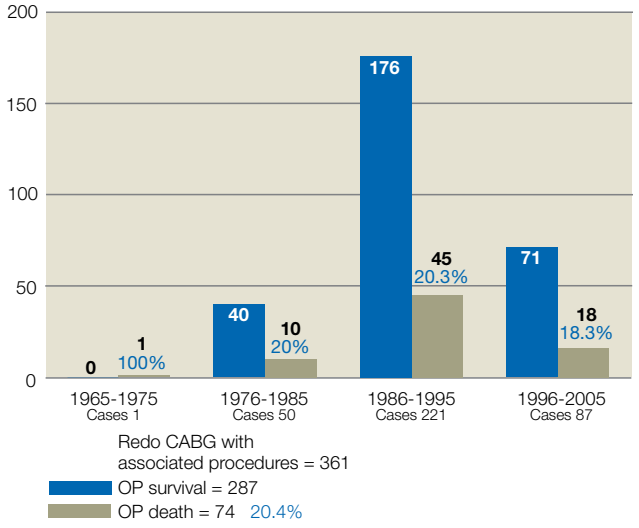


Figure 12. Redo CABG with associated procedures

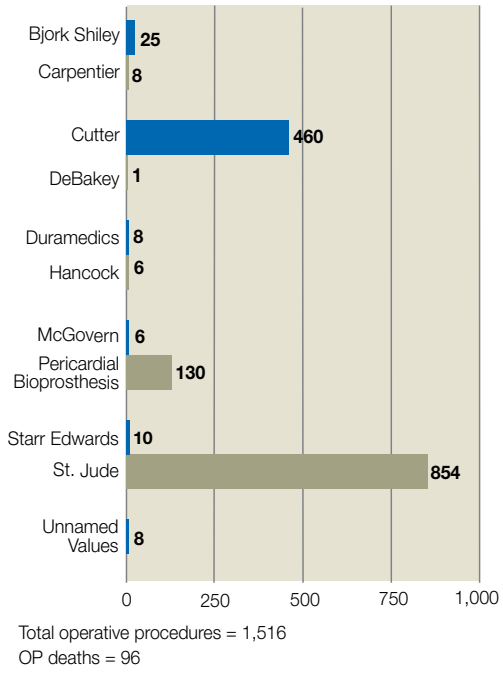


Figure 13. Aortic valves

struction, and left ventricular aneurysm repair. (Other associated procedures included arch aneurysm resection, lung resection, cholecystectomy, utilization of the intraaortic balloon pump IABP and 233 other miscellaneous operations.) The operative mortality remained little changed over four decades, averaging 11.5% for these higher risk, complex procedures. Long-term graft patency studies demonstrated arterial grafts to be superior to venous grafts at 5- and 10-year follow up. In the last two decades of the series, almost 100% of patients received a combination of arterial and venous grafts particularly in redo coronary artery operations (Figure 10). Internal thoracic and radial arteries were most frequently utilized.

Combined carotid and coronary artery revascularization were performed in 293 patients presenting with symptoms of both cerebral vascular insufficiency and coronary artery ischemia or with severe structural abnormalities of the carotid artery; mortality and morbidity were 6% in this high-risk group. The rationale of the combined procedure was to reduce the risk of stroke near and long term.

Redo Coronary Artery Bypass Alone

Reoperative coronary artery bypass procedures accounted for 1,077 cases (Figure 11), the majority of which occurred in the third decade of Dr. Howell's practice. There were 1,047 survivors and 30 hospital

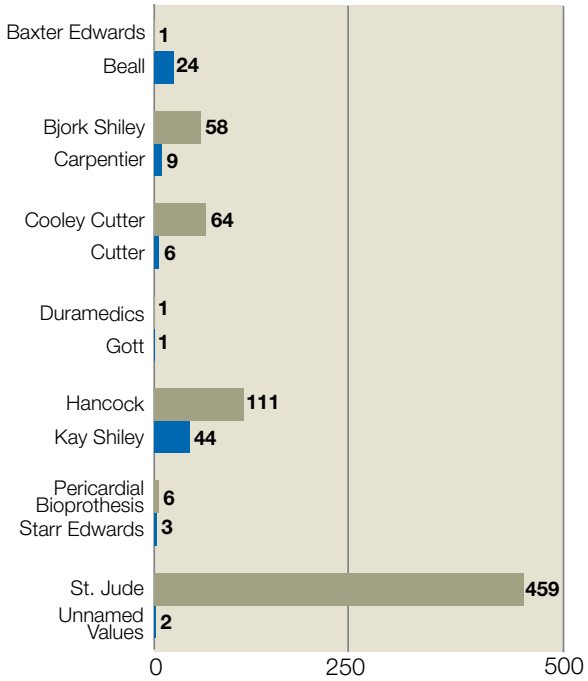


Figure 14. Mitral valves

Image provided courtesy of St. Jude Medical Inc.

Figure 15. St. Jude mechanical valve and St. Jude biological tissue valve.

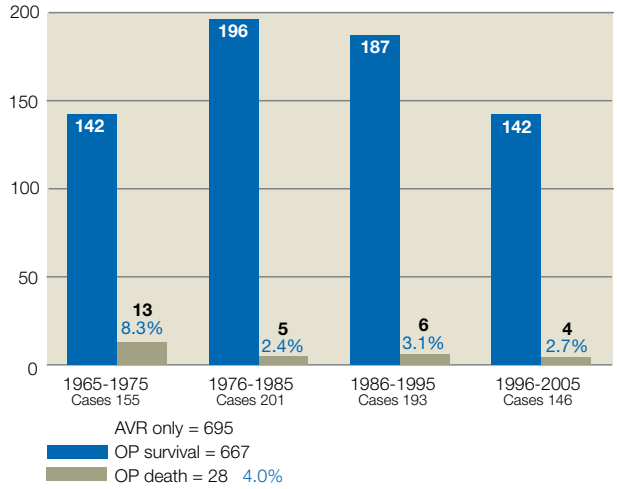


Figure 16. AVR only; STS benchmark 2001 = 4.0%

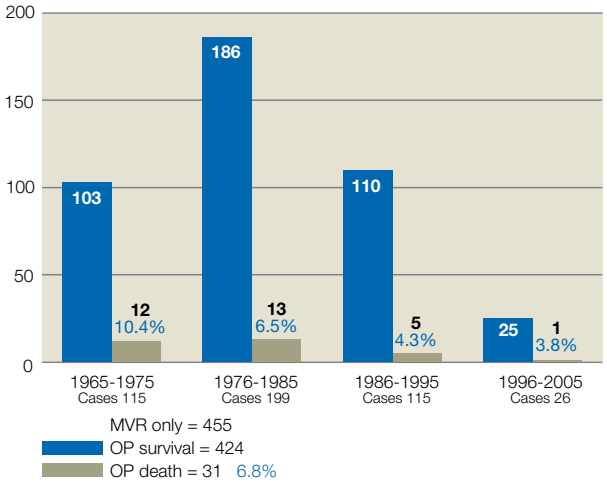


Figure 17. MVR only; STS benchmark 2001 = 6.5%

deaths for a 30-day mortality of 2.7%. This mortality remained well below the STS benchmark of 5% over all four decades.

Redo Coronary Artery Bypass with Associated Procedures

Redo coronary artery bypass surgery with associated procedures was performed on 361 patients (Figure 12). There were 287 survivors with 74 operative deaths for a 30-day mortality of 20.4%. The added degree of surgical complexity accounted for the higher risk compared to redo coronary artery bypass alone. Valve replacement, reconstruction of left ventricular chamber, and carotid artery revascularization accounted for the majority of the associated procedures. Intra-aortic balloon pump was employed in 50% of these procedures.

Valve Operations

Operations on heart valves were performed in 2,745 cases and consisted of replacement, repair, or a combined procedure utilizing mechanical or bioprosthetic valves. A variety of valves were utilized over the four decades (Figures 13 and 14), with St. Jude mechanical being the most frequently used (Figure 15).

Isolated aortic valve replacement procedures were performed on 695 patients. There were 667 30-day survivors and 28 deaths for a 30-day operative mortality of 4.0% for the four decades. This is comparable to the STS benchmark of 4% in 2001. However, over the last three decades, the average mortality averaged 2.7% and distinctly less than the STS benchmark (Figure 16).

There were 455 operations for isolated mitral valve replacement; 424 survived and 31 expired for a total 30-day operative mortality of 6.8% compared to the STS benchmark in 2001 of 6.5%. The 30-day mortality over the last three decades steadily improved (Figure 17).

Approximately one-sixth of the valve procedures

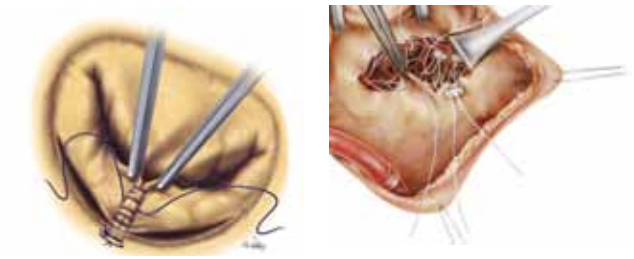


Image provided courtesy of W.L. Gore & Associates, Inc.

Figure 18. Left: Mitral valve repair involving quadrangular resection of posterior leaflet. Right: Mitral valve repair involving chordal replacement with Gortex.

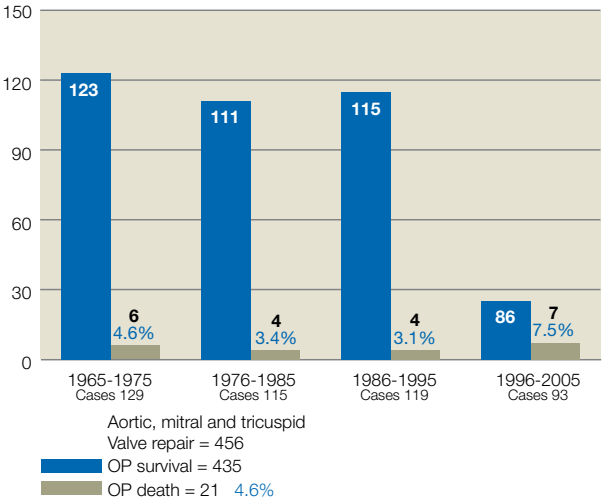


Figure 19. Aortic, mitral and tricuspid valve repair; STS benchmark for mitral valve repair 1991 = 4.2%

involved valve repair or reconstruction of the aortic, mitral (Figure 18), or tricuspid valve. In this group, the 30-day mortality averaged 4.6%, favorably compared to the STS benchmark for mitral valve repair in 1991 of 4.2% (Figure 19).

Aortic Valve With Associated Procedures

Aortic valve replacements with one or more associated procedures numbered 806 accounting for more than 50% of the total AV valve procedures performed. The most common associated procedures included CAB, reconstruction of an ascending aortic aneurysm, or some other valve procedures. There were 741 survivors and 65 operative deaths for a 30-day operative mortality of 8.0%, more than doubling the operative mortality for isolated aortic valve replacement (Figure 20). Similarly with mitral valve replacement, there was an increase in complexity and comorbidity. There were 334 mitral valve replacements with associated procedures and 47 deaths for 30-day operative mortality of 14% (Figure 21).

In this series, there were 23 tricuspid valve replacements, always associated with concomitant aortic or

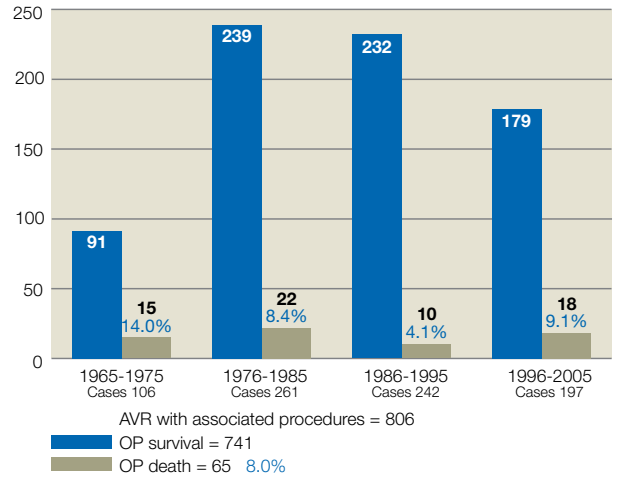


Figure 20. AVR with associated procedures

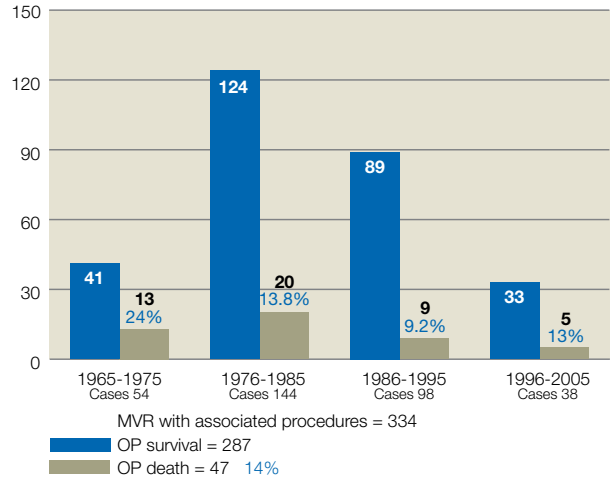


Figure 21. MVR with associated procedures

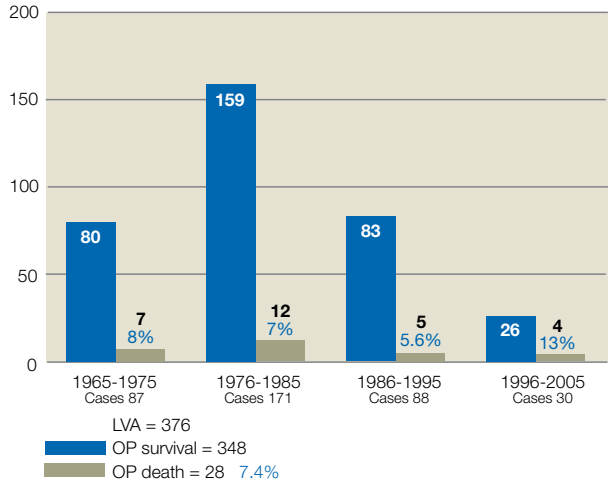


Figure 22. LVA

mitral valve operations. In most cases, the tricuspid valve was replaced with a biologic tissue valve. Two of the 23 patients receiving tricuspid valve replacement expired.

Left Ventricular Aneurysm

Reconstruction for left ventricular aneurysm (LVA) formation following left ventricular (LV) infarction was performed in 376 patients with an overall mortality of 7.4% (Figure 22). This operation was performed most often in conjunction with CABG and repair of post-infarction ventricular septal defects (VSD). However, included in this series were 50 patients who had surgery to repair only the LV aneurysm, and no mortality occurred in this group (Figure 23).

In 301 patients, LVA resection was combined with myocardial revascularization, resulting in improved long-term results and reducing mortality from 20% (STS Benchmark) without revascularization to 6.6% with revascularization (Figure 24).

In this series, 325 patients underwent LVA reconstruction associated with other procedures such as repair of a ruptured ventricular wall (Figure 25). There were 298 operative survivors with an 8.3% operative mortality (Figure 26).

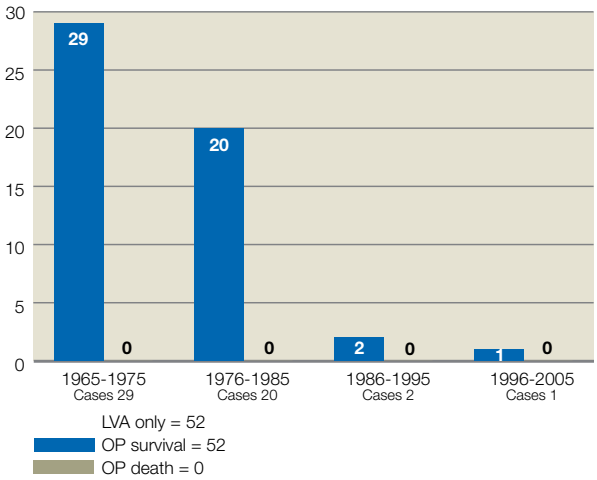


Figure 23. LVA only

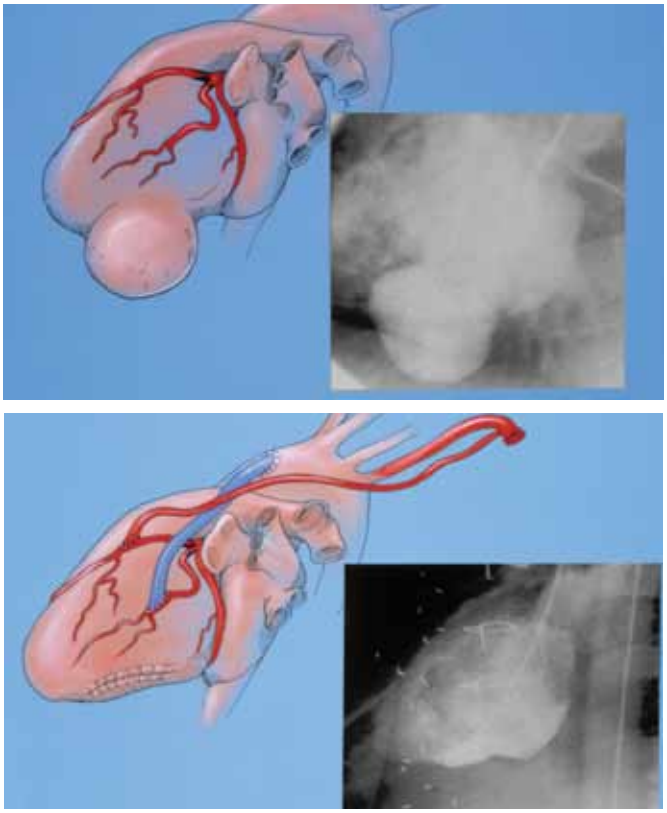


Figure 25. Top: Acute posterior wall infarction with contained ruptured posterior wall aneurysm. Bottom: Repair of ruptured posterior wall aneurysm and associated myocardial revascularization.

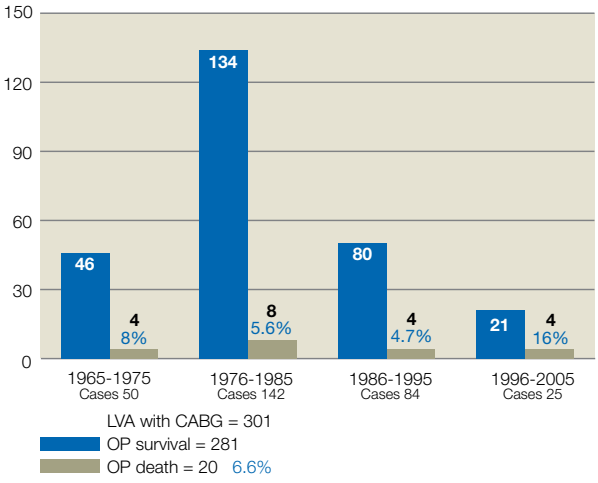


Figure 24. LVA with CABG

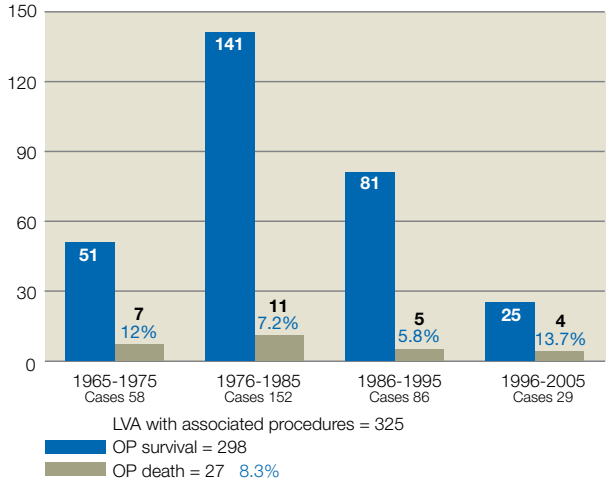


Figure 26. LVA with associated procedures

Procedure	Cases	Operative Deaths	Mortality
VSD + LVA	11	6	55%
VSD + VA + CAB	8	2	25%
VSD + VA + VALVE	3	0	0%
VSD + CAB	2	0	0%
ALL CASES	24	8	33%

Table 1. Post infarction ventricular septal defect

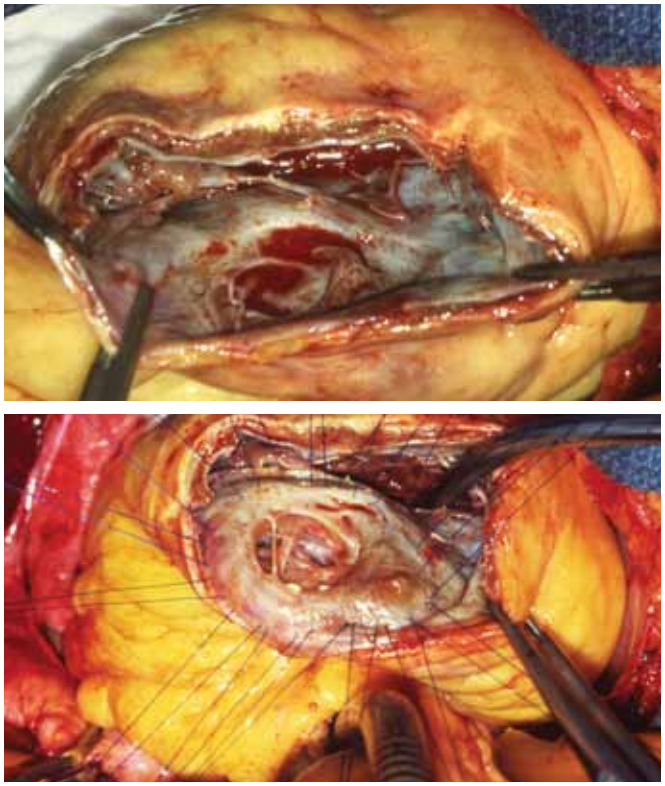


Figure 27. Top: Post infarct VSD with patch graft repair. Bottom: Surgical exposure of post infarction.

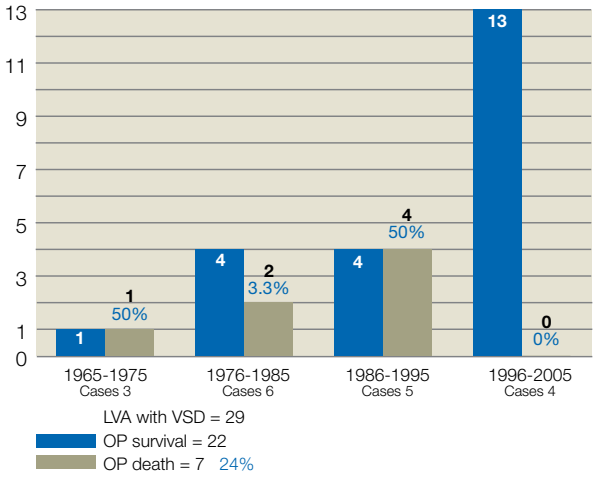


Figure 28. LVA with VSD

Post Infarction Ventricular Septal Defect

Mortality after post-infarction ventricular septal rupture exceeds 90% at one year if untreated. Twenty-four such defects were surgically repaired during four decades (Table 1). Acute intervention was the choice in most of the patients in this series, with outcomes better than anticipated. More than 70% of these patients were alive at 24 months. Meticulous surgical techniques minimize the likelihood of disruption of the suture line or incomplete repair, which can lead to recurrence of the defect with resulting high mortality (Figure 27 and 28).

Associated procedures such as coronary revascularization (10 patients) (Figure 29) and valvular reconstruction or replacement (3 patients) greatly improved operative results (Table 1) with overall 33% mortality. Myocardial preservation techniques improved survival, especially during the last decade with no operative deaths (13 pts.).

Tumors of the Heart

Since the advent of echocardiography, cardiac neoplasms have become readily recognizable. And with cardiac MRI now available, tissue characterization differentiating benign and malignant cardiac tumors and thrombus is increasingly possible. This series includes 31 patients with cardiac tumors that were treated surgically. Cardiac myxoma accounted for 23 of these cases, with no surgical mortality (Figure 30). (Editor's Note: I recall one day when there were three left atrium myxomas on Dr. Howell's surgical schedule.) There was one benign fibroma obstructing the left ventricular outflow track that was surgically removed and seven patients operated on for primary sarcoma of the heart. Out of the 31 patients, the only mortality occurred in two cases of inoperable sarcoma.

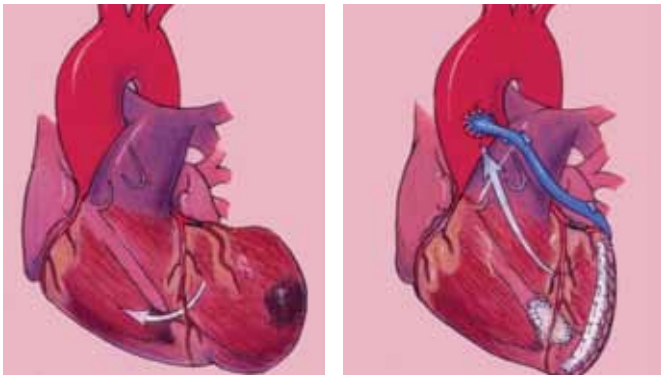


Figure 29. Left: Myocardial infarction with anterior wall aneurysm and distal ventricular septal rupture. Right: Aneurysm resection and repair with associated patch graft repair of VSD and myocardial revascularization.

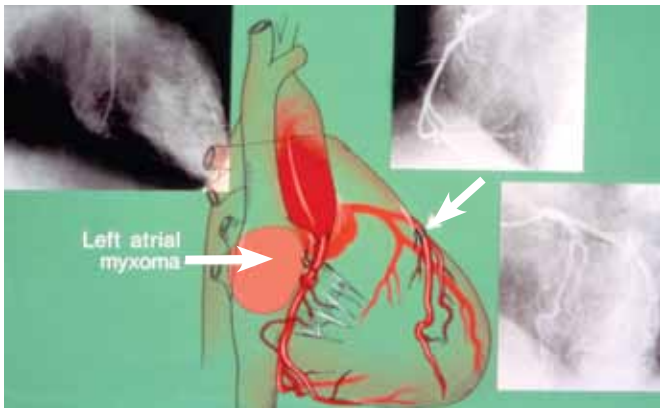


Figure 30. Myxoma filling the left atrial cavity with obstruction of the mitral valve.

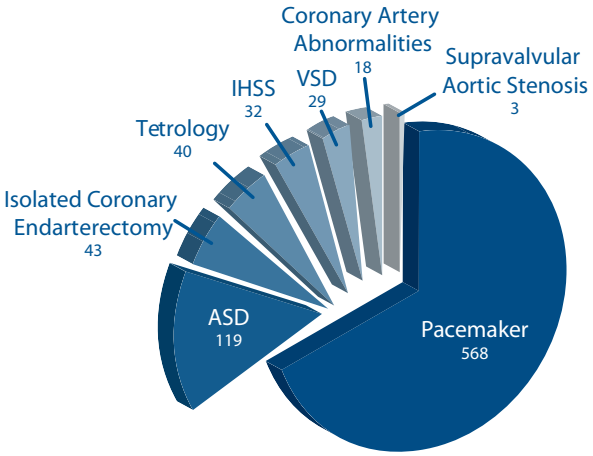
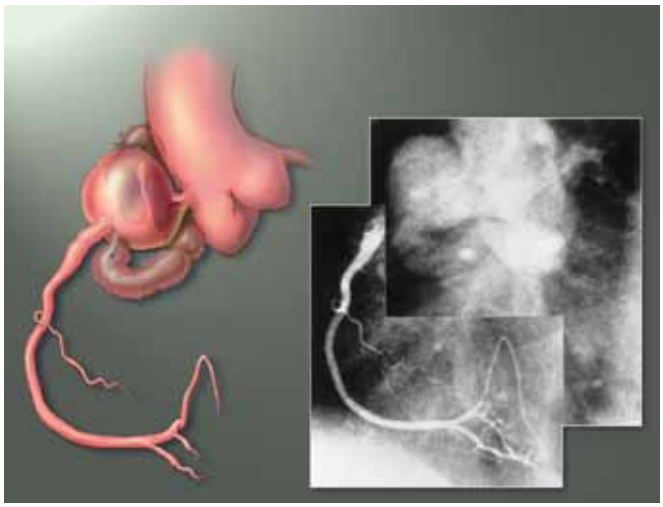


Figure 31. Miscellaneous cardiac operations



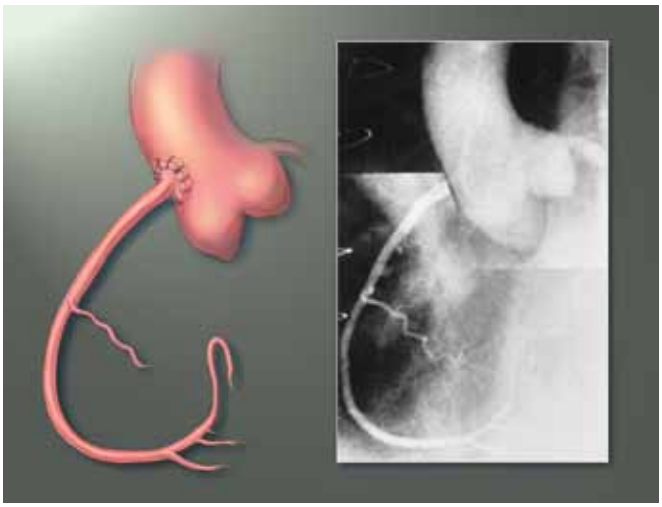


Figure 32. Left: Giant right coronary artery aneurysm and associated fistula to the right atrium. Right: Post operative reconstruction with resection of aneurysm, coronary artery, and closure of fistula to the right atrium.

Miscellaneous Cardiac Operations

The subset of this overall series categorized as miscellaneous cardiac operations was composed of 852 procedures (Figure 31) that included one or more of the following: repair of a congenital heart defect (atrial septal defect, ventricular septal defect, Tetralogy of Fallot), septal myomectomy for idiopathic hypertrophic subaortic stenosis (IHSS), subaortic ring, coronary artery malformation, and pacemaker insertion (Figure 32).

Pacemaker insertion had the largest number of patients in this series (568), and the 12 total deaths were all associated with a myocardial infarction or stroke occurring after the pacemaker insertion. There were two deaths in the IHSS group for a mortality of 5.5%. There was no mortality associated with any of the other procedures.

Carotid Endarterectomy

Surgery for cerebral vascular insufficiency was first performed at this institution by Michael E. DeBakey, M.D., and has continued to evolve over time. Dr. Howell has performed operations on 3,523 patients for this condition during the past four decades. Out of those, 3,313 patients were operated on for carotid artery insufficiency and the remaining cases for vertebral artery insufficiency. During these four decades, electroencephalography (EEG) monitoring, first adopted by Dr. Howell at The Methodist Hospital, has continued as the gold standard for monitoring cerebral blood flow, thus avoiding routine carotid artery shunting.

Right or left carotid endarterectomy was performed in 2,874 patients. There were 26 deaths and 2,848 survivors with a mortality rate of 0.9% over the four decades. The mortality after the first decade never exceeded 0.8%, and the last decade mortality rate was 0.3% (Figure 33).

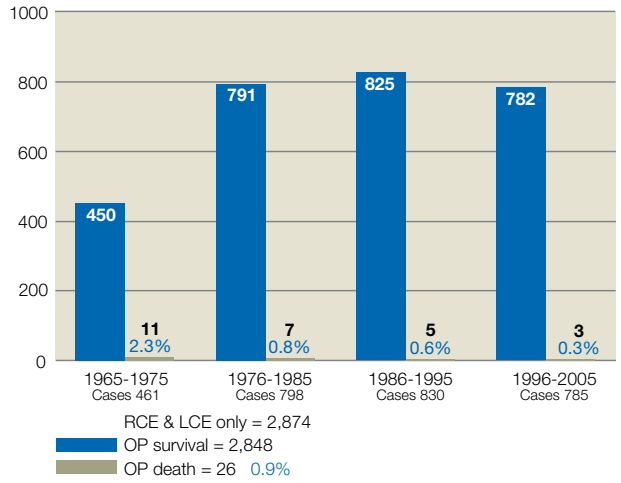


Figure 33. RCE & LCE

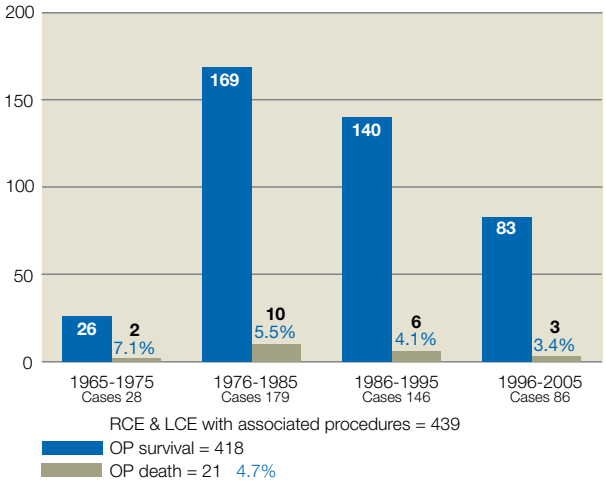


Figure 36. RCE & LCE with associated procedures

Figure 34. EEG monitoring during carotid endarterectomy.

Figure 35. Left: Acute occlusion of the left caratid artery with extensive thrombus formation. Right: Post operative reconstruction with endarterectomy, thrombectomy, and patch graft angioplasty.

This improvement in mortality is attributed to using intraoperative EEG (Figure 34) while performing patch graft reconstruction utilizing either vein or bioprosthetic material (Figure 35).

Right or left carotid endarterectomy with associated procedures was performed in 439 patients. The most common associated operations encompassed a CAB or valve surgery. Operative mortality and morbidity increased with the combined operation, but even with this change, the mortality has steadily decreased over the four decades (Figure 36).

Aneurysmal Disease

Between 1965 and 2005, great vessel aortic resections were completed in 2,023 patients for aneurysmal disease. Abdominal aortic resections accounted for 1,532 patients in this series.

Abdominal Aortic Aneurysm

In this series, 964 patients had resection for isolated aneurysms of the abdominal aorta (AAA) and 568 had abdominal aortic aneurysm section in combination with associated procedures (Figures 37 and 38). In the AAA only group, after the initial decade, the 30-day operative mortality was less than 2.0% and declined each decade thereafter (Figure 39). For the AAA group with associated procedures, the mortality rate declined steadily after the first decade (Figure 40).

Great Vessels

Great vessel operations on the ascending aorta, aortic arch, descending aorta, and thoracoabdominal repairs were performed on 953 patients. Another 31 patients were operated on for coarctation of the thoracic aortic for a total of 984 patients.

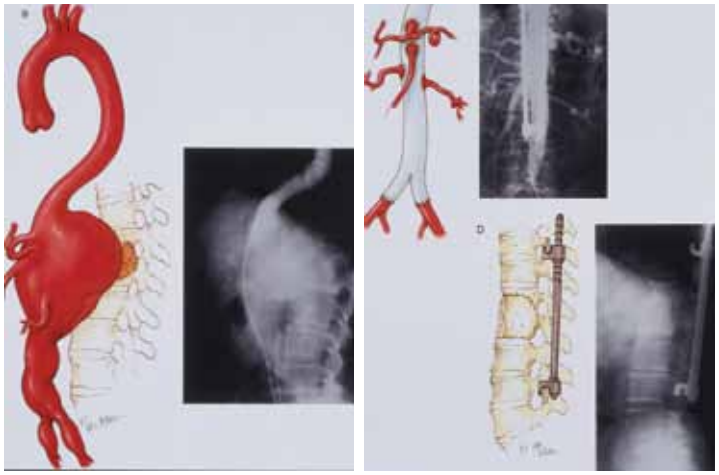


Figure 37. Left: Preoperative aortogram of abdominal aneurysm with involvement of renal and visceral vessels with erosion of the spine. Right: Post operative aortogram following resection of aneurysm with reconstruction of renal and visceral artery with Dacron graft and stablization of the spine.

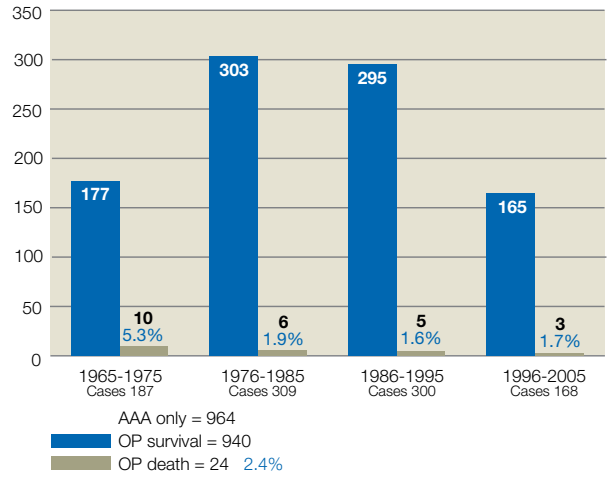


Figure 39. AAA only

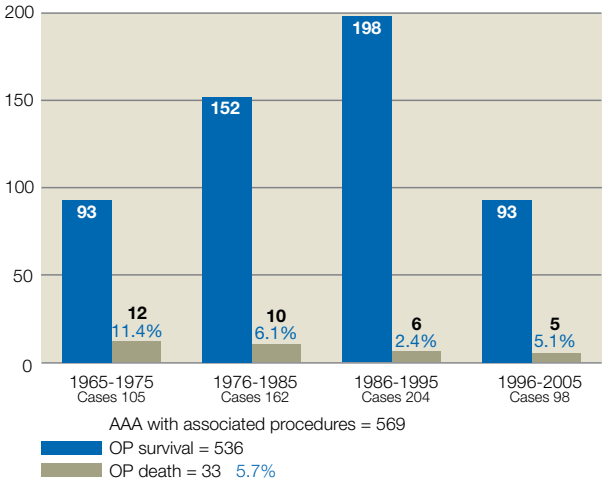


Figure 40. AAA with associated procedures

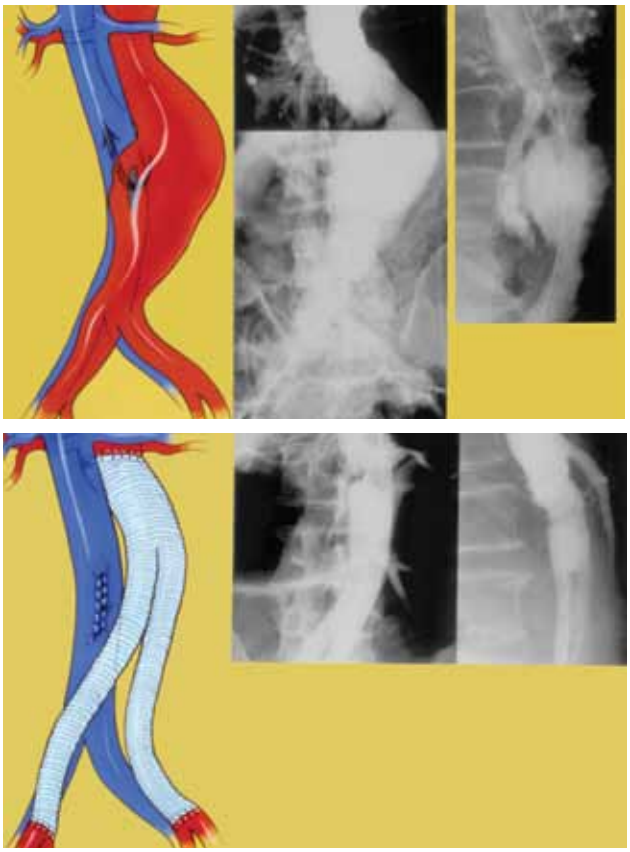


Figure 38. Top: Aneurysm of abdominal aorta with rupture into inferior vena cava. Bottom: Post operative study following resection of aneurysm and repair of inferior vena cava.

Uncomplicated Aneurysm of Ascending Aorta and Aortic Arch

Simple aneurysms of the ascending aorta or the aortic arch accounted for 153 patients during this four-decade period. During the formative phase of operations for complex aortic disease, the operative mortality peaked at 15% in the third decade before declining drastically in the fourth decade after the operation became more refined and standard (Figure 41).

Ascending aorta and aortic arch aneurysm operations with associated procedures were more the norm, with a total of 475 patients receiving surgery with this combination. Coronary bypass and valve replacement were the most common associated procedures. In this group as well as that above, the operative mortality declined during the fourth decade (Figure 42).

Acute dissection of the ascending aorta and arch were encountered in 61 patients, and all were operated on emergently (Figure 43). The operative mortality was 31.1% (Figure 44), with 19 of the 61 patients dying from rupture or complications of rupture. An example of an acute ascending aortic dissection and rupture into the right ventricle is displayed in Figures 45 and 46.

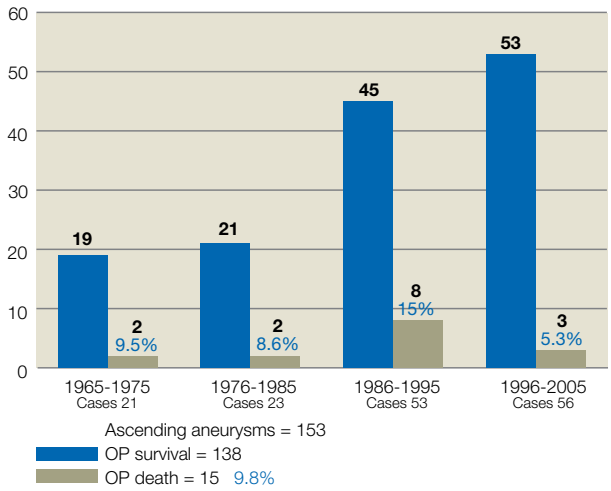


Figure 41. Aortic aneurysms

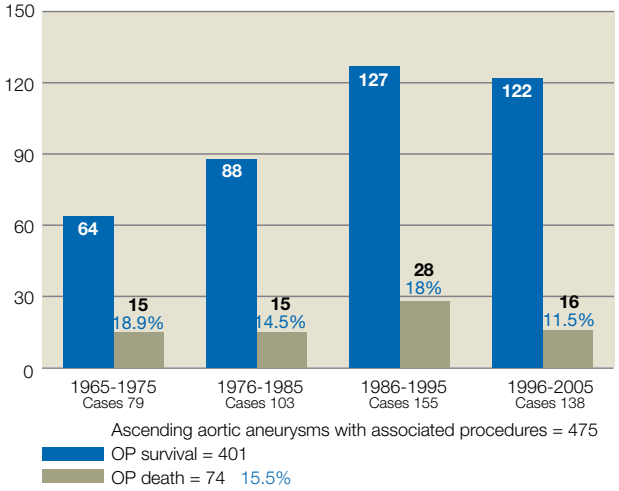


Figure 42. Ascending aortic aneurysms with associated procedures

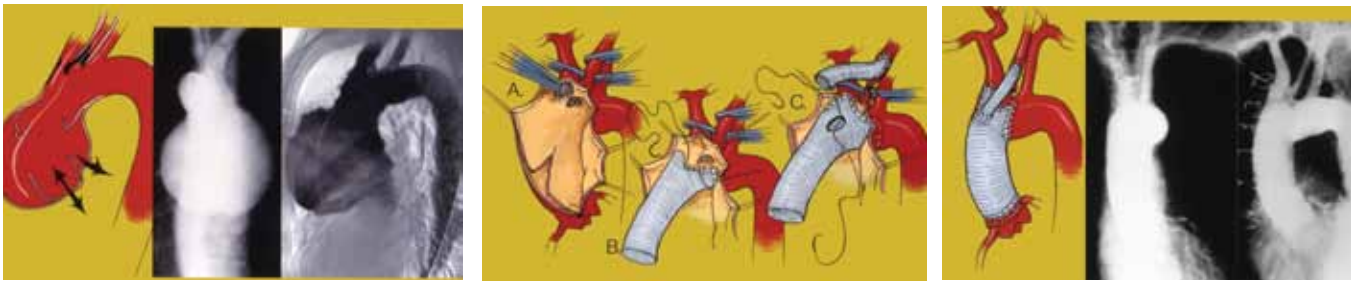


Figure 43. Left: Acute type II dissecting aneurysm with subsequent rupture at base of heart. Middle: Method of reconstruction. Right: Postoperative aortogram and depiction following reconstruction.

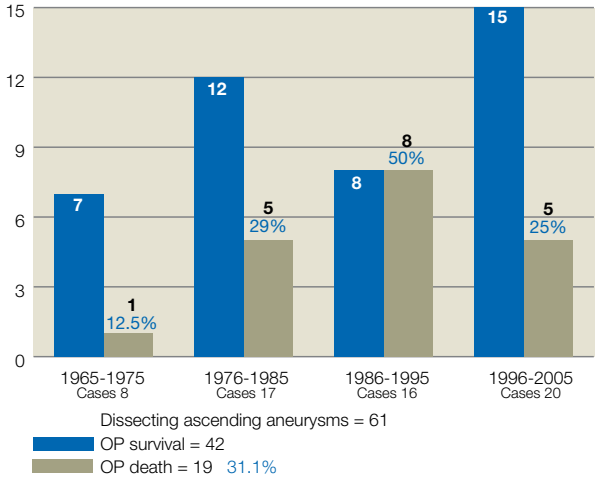


Figure 44. Dissecting ascending aortic aneurysms

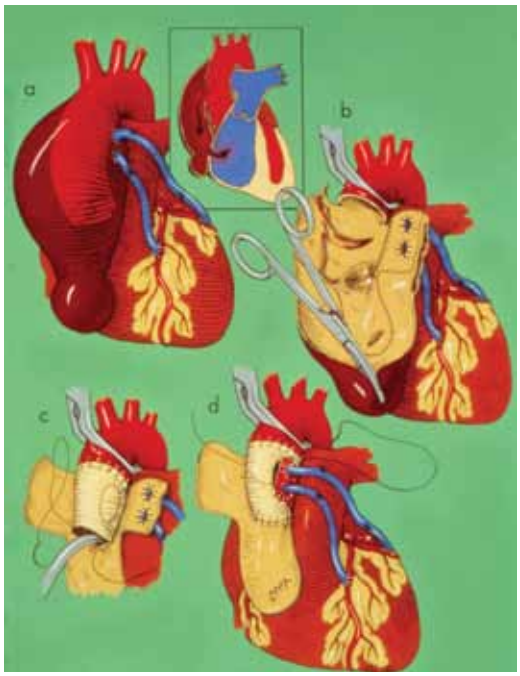


Figure 45. Series depicting the reconstruction of a type II dissection with rupture into he right ventricle.

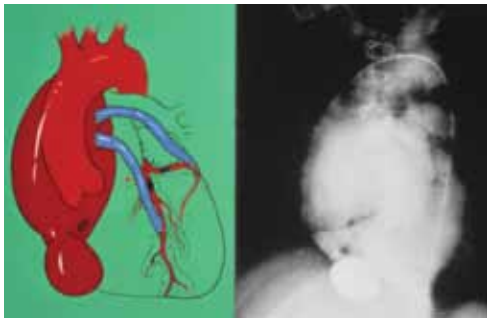
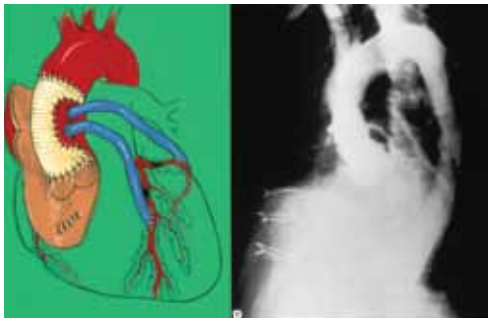


Figure 46. Patient status post CABG with acute type II dissection with rupture into the right ventricle with fistula.



Resection of type II dissection and replacement of ascending aorta with Dacron graft, reimplantation of venous bypass grafts, and closure of the fistula to the right ventricle.

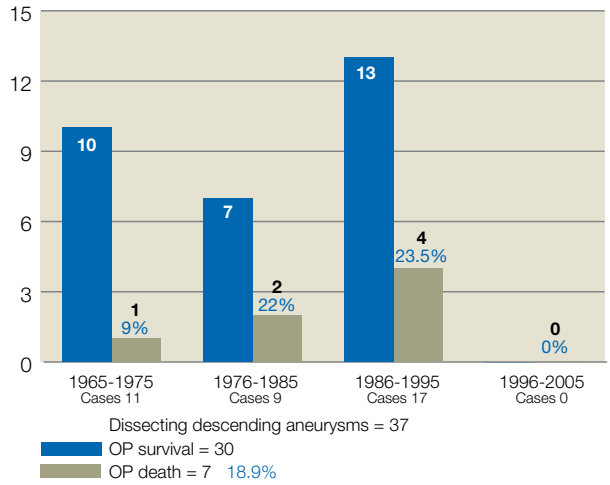


Figure 48. Thoracoabdominal aneurysms

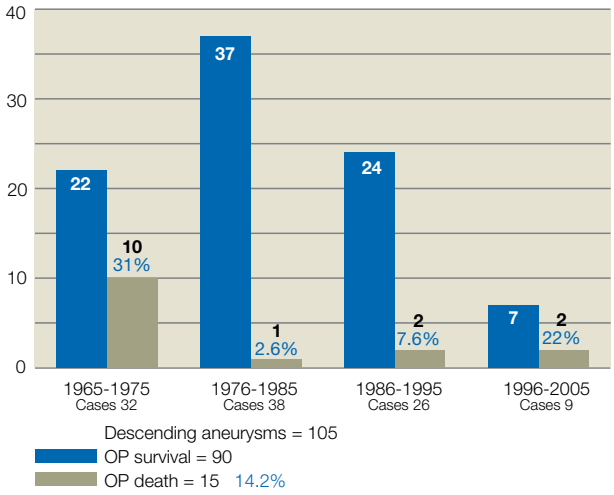


Figure 47. Thoracic aneurysms

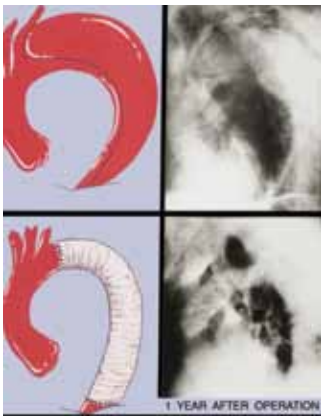


Figure 49. Type III dissecting aneurysm of the descending thoracic aorta with post operative reconstruction utilizing a Dacron graft.

Thoracic Aneurysms

Descending thoracic aortic aneurysms accounted for a lesser number of aneurysms in this patient population, with 142 operated on in this series. Of this number, 37 patients underwent surgery for acute dissection either because of rupture or acute expansion. In those patients operated on for a non-dissecting aortic aneurysm (105), the average mortality rate over the four decades was 14.2% — ranging from 2.6% in the second decade to 31.2% in the first decade (Figure 47).

For those operated on for acute dissection of the descending thoracic aorta (37), the 30-day operative mortality ranged from 9–23.5% for the first three decades (Figure 48). There were none performed in the fourth decade, partly due to the development of endovascular interventional techniques with graft placement. An example of a type-three dissecting aneurysm of the descending thoracic aorta is seen in Figure 49.

Thoracoabdominal Aneurysms

Thoracoabdominal aneurysms present the most challenging aspects of aortic surgery. Few surgeons were inclined to make them a routine practice until E. Stanley Crawford at Baylor College of Medicine refined the technical aspects to yield a marked reduction in mortality and spinal cord paralysis. He publicized his principles in his book, *Diseases of the Aorta*.[1] There were 122 patients operated on for thoracoabdominal aneurysms in Dr. Howell's 40-year series, with the majority performed during the last decade. The mortality and morbidity for this operation has continued to decline (Figure 50). An example of a thoracoabdominal aneurysm reconstruction is seen in Figure 51.

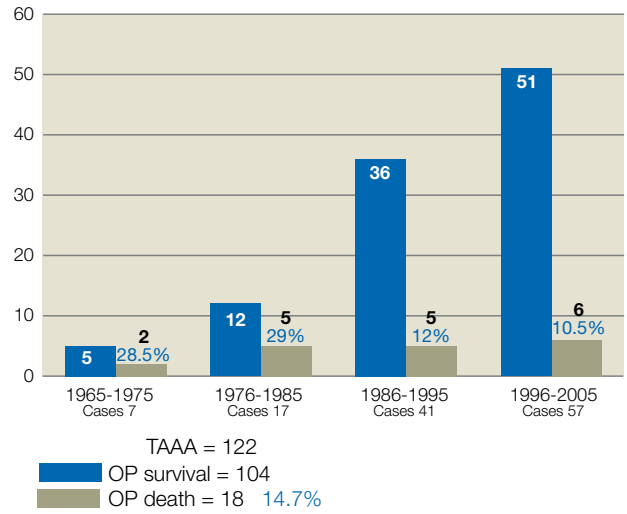


Figure 50. TAAA

Vascular Occlusive Disease

Surgical reconstruction for both aortic and peripheral vascular occlusive disease was performed in 2,383 patients in this series. Reconstruction of the aortic or iliac segment of the aorta for occlusive disease was accomplished in 1,016 patients (Figure 52).

Leriche Syndrome

In this situation, indications for surgery were either significant claudication or tissue loss in the lower extremities. Dacron bifurcated grafts were utilized in the majority of these cases, with endarterectomy and patch grafting to a lesser degree. Overall 30-day operative mortality of 1.1% was constant over four decades. The most common associated procedures were renal artery and visceral reconstruction with Dacron grafts (Figures 53 and 54).

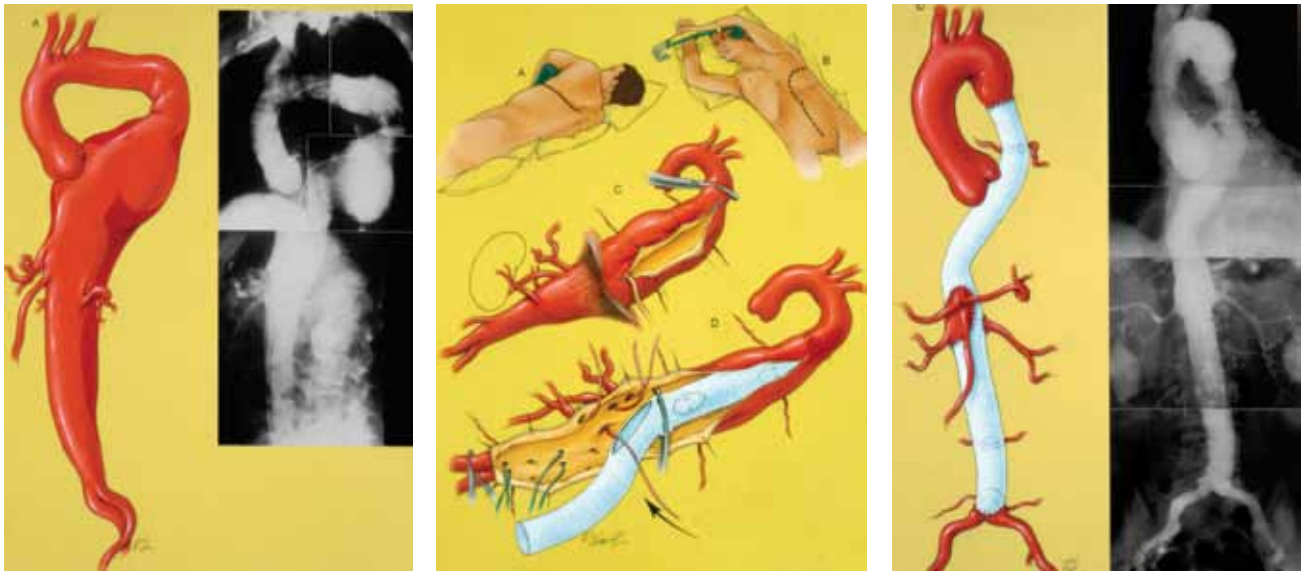


Figure 51. Left: Extent III TAAA involving the thoracic and abdominal aorta. Middle: Method of reconstruction with reimplantaton of intercostal, visceral and renal arteries. Right: Post operative aortogram and depiction of completed repair.

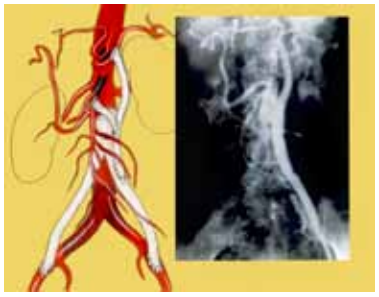


Figure 52. Patient with aortoiliac occlusive disease with associated occlusion of celiac and SMA and chronic visceral insufficiency. Post operative aortogram demonstrating a functioning aorta, bilateral femoral, celiac and superior mesenteric arteries.

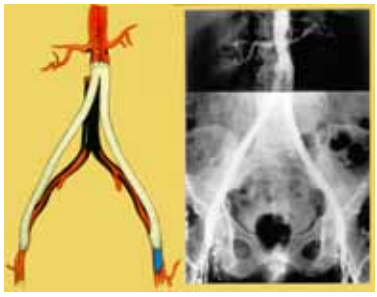


Figure 53. Total occlusion of the abdominal aorta. Thrombo-endarterectomy and reconstruction of the aorta with a bifurcated Dacron graft to the femoral arteries.

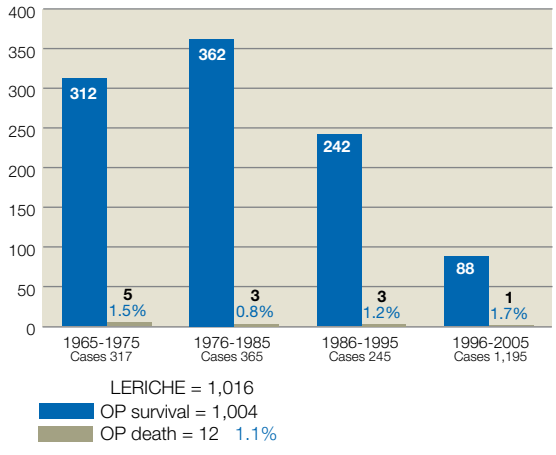


Figure 54. LERICHE

Lower Extremity Revascularization

Revascularization of the femoral, popliteal, and tibial segments was accomplished in 1,367 patients with a 1% 30-day operative mortality over four decades (Figure 55). Femoral popliteal and femoral tibial bypasses were performed with a multitude of graft materials including Dacron, Gore-Tex, homologous saphenous vein, and autologous saphenous vein. Other patch graft material included pericardium. Autologous saphenous vein proved to be the material of choice and has been used with excellent long-term results for the past 30 years (Figures 56 and 57).

Tibial vessel reconstruction is usually reserved for gangrene or tissue loss of the lower extremities. The material of choice is autologous saphenous vein (Figure 58).

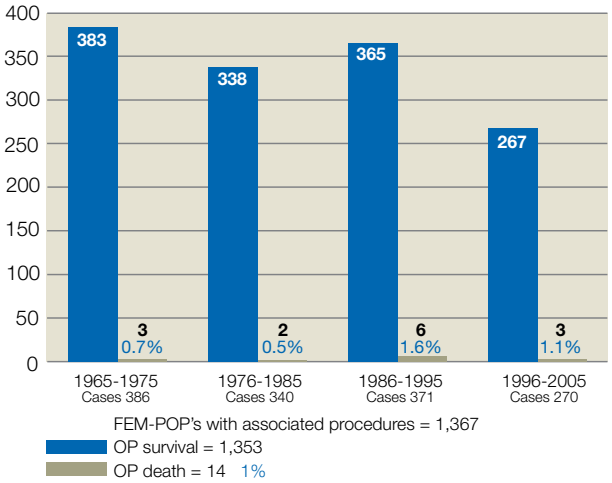


Figure 55. FEM-POP's with associated procedures

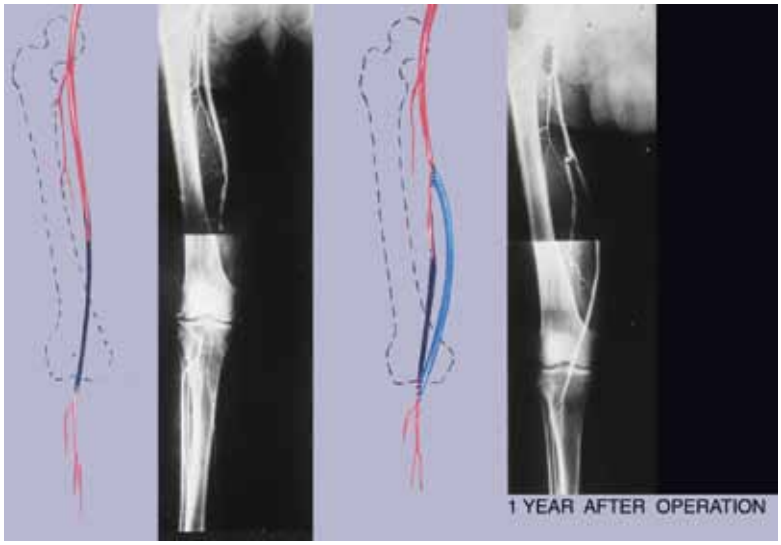


Figure 56. Superficial femoral artery obstruction with saphenous vein bypass graft reconstruction.

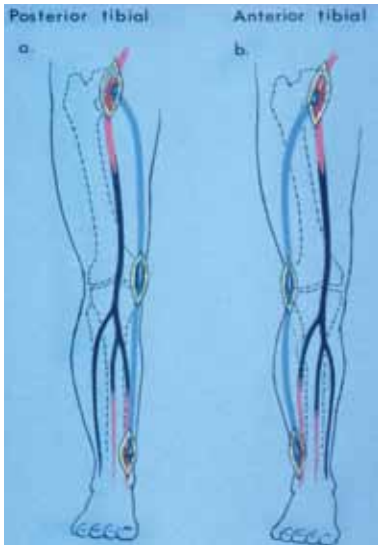


Figure 58. Concepts of reconstruction of anterior or posterior tibial vessels utilizing saphenous vein grafts.

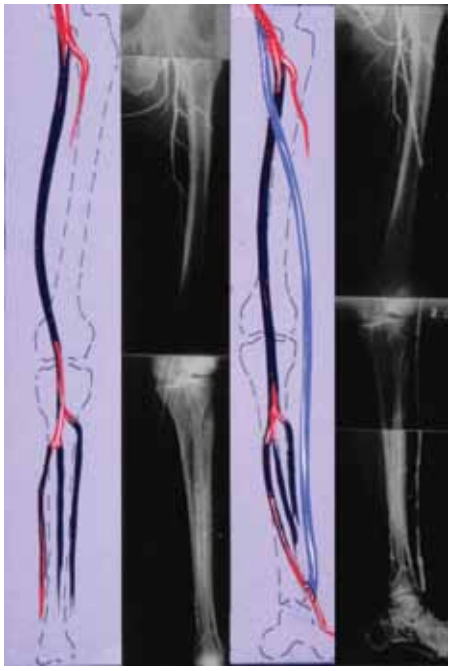


Figure 57. The first documented (1964) anterior tibial bypass and post operative arteriogram demonstrating functioning graft.

Visceral Artery Reconstruction

Visceral artery reconstruction (bypass graft, patch graft) for acute or chronic visceral artery insufficiency was performed in 70 cases. Superior mesentary artery bypass was the most common operation, and the least performed was a combination of superior mesentary artery and celiac artery reconstruction (Figure 59). There was no operative mortality with this series.

Isolated renal artery reconstruction for intractable hypertension was performed in 275 patients with no operative mortality.

Miscellaneous Vascular Operations

Other miscellaneous vascular operations were performed in 1,975 patients. These procedures included embolectomy, thromboembolectomy, sympathectomy, upper extremity reconstruction for occlusive vascular disease, and/or aneurysm resection and arterial venous malformations (Figure 60). There were 19 deaths following embolectomy or thromboembolectomy of the aorta or lower extremities. Another 17 died of postoperative myocardial infection and two of stroke in this series. One death occurred following pulmonary embolization secondary to repair of an AV fistula of the lower extremity. The total of 20 deaths in this series represents a 0.01% mortality rate.

References

1. Crawford, ES, Crawford, JL; Diseases of the aorta. Williams and Wickens. Baltimore, MD. 1984.

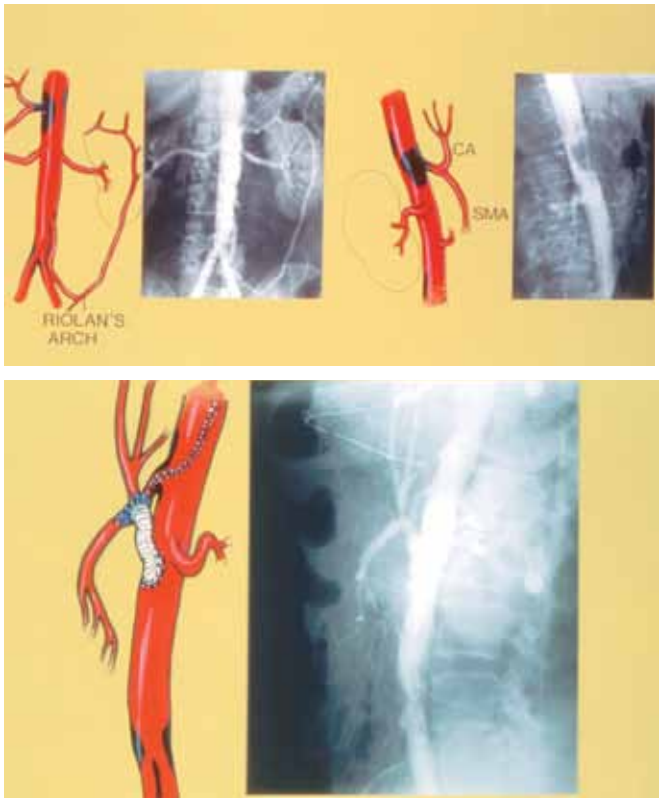


Figure 59 Top: Localized obstruction of the aorta and involvement of the SMA with visceral artery insufficiency. Bottom: Follow up aortogram demonstrating post operative endarterectomy with functioning SMA bypass graft.

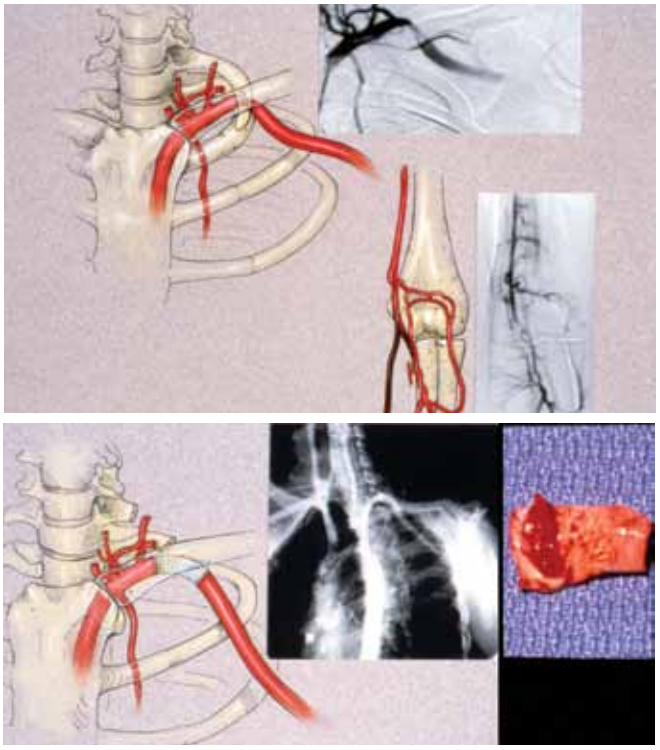


Figure 60. Top: Subclavian artery obstruction with embolization secondary to cervical rib compression. Bottom: Resection of cervical rib and segment of 1st rib with resection of subclavian obstruction with graft interposition.