

Early Breast Cancer

Its History and Results of Treatment

Carl M. Mansfield, Philadelphia, Pa.



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Introduction

The purpose of this monograph is not to advocate a particular treatment technique but to try to show that claims of superior therapeutic results by any particular treatment modality is questionable and usually based upon doubtful data. The usual course of events is that the patient finds a lump and may go to a physician at varying times thereafter. When appropriate diagnostic studies are completed, she is seen by a surgeon who decides whether an operation is feasible.

It is now becoming obvious that hidden within this little scenario are thousands of known and unknown factors that will determine the ultimate course of the disease. It may be that one of the least important is the decision regarding the type of therapy.

If this is true, physicians should make efforts towards finding the best method of diagnosis and treatment, rather than narrow-mindedly insisting upon their own particular treatment technique. The ultimate objective should be a curative technique that causes the least psychological and physical disruption to the patient.

History

There is very little tumor material preserved from prehistoric times or early history. This is especially true if one considers only malignant tumors (331). However, some authors feel that cancer does date back beyond the dawn of history (164). There still remains the question as to whether the few cancer cases found is due to a low cancer incidence in the prehistoric era, or if it is only an apparent decreased incidence because people died younger. If the former were the case, one might wonder if cancer is a disease of civilization (338).

The history of breast cancer has many regions of uncertainty. Some of the oldest medical and surgical writings do mention breast disease, but there is some doubt as to whether any of the conditions described represented breast cancer (49). For example, the *Ebers medical papyrus*, (104) written about 1500 BC (the contents are probably of an older date, possibly about 3000 BC), mentions the treatment of breast cancer by local inunctions and incantation. One remedy for the ill breast was 'Calamine, gall of ox, fly's dirt, yellow ochre', this was mixed together and rubbed on the breast for 4 days (49). The *Edwin Smith papyrus* (3000–2500 BC) (45), sometimes known as the 'Surgical papyrus', included 48 cases; it described eight cases of breast disorders. Some or all of these cases have been considered by various authorities to represent malignant breast tumors or ulcers (78, 164, 205). There are others who argue, quite convincingly, that these eight cases were traumatic or inflammatory in nature (49, 320). *Sigerist* (331) points out that there has never been a case of cancer of the breast found in an Egyptian mummy (318). One case (No. 39) in the *Edwin Smith papyrus* was treated by cauterization with a fire drill (this is probably the oldest known reference to this practice) (45). Among the oldest Indian writings is the ancient epic of *Ramayana* (72, 364) (written about 2000 BC); it mentions surgical extirpation, ointment of arsenic compounds and cautery for treatment of tumorous growth. Mammary carcinoma is mentioned in the cuneiform tablets in the library of King Ashurbanipal of Assyria (699–626 BC), located in the great city of Ninevah. These tablets are probably copies of writings that date back to 2000 BC (233, 244). *Herodotus* (184) (520 BC) is quoted as saying that the Persian slave, Democles, cured Atossa, daughter of Cyrus and wife of King Darius Hystaspis, of breast cancer (205). Here again, there is some doubt as to

whether this was a malignancy. It is felt that it may have been a case of inflammatory mastitis (49, 321).

There are two references to cancer of the breast by Hippocrates (78, 201, 202). The first is in *Epidemics I* and again in *Epidemics VII*, apparently referring to the same case. The second is found in *Disease of women* (219). A Hippocratic writer believed that under certain conditions menstrual discharge retained in the uterus was carried to the breast and eventually formed a cancer (164). *Aulus Cornelius Celsus* (66, 67) (42 BC–37 AD) thought that irritation of a malignant tumor or unwise intervention could harm the patient. He felt that excision merely removed the affected part and burning only exasperated the tumor. *Celsus* advised against removal of the pectoral muscles. He felt that caustics should be applied followed by removal of the breast if they failed. He spoke against the use of both surgery and cautery except in early cases where the progression, from what his contemporaries called, a 'cacoethes' to a cancer had not yet occurred. His warning went unheeded because it seems apparent that early Roman surgeons performed extensive surgery for breast cancer (233). It is worthy of note that the removal of the pectoral muscles was performed during this time only to be discarded during the Dark Ages and not to be rediscovered until nearly 18 centuries later.

Aetius (8, 164) wrote that *Leonides* of Alexandria (sometime around the first century AD) removed mammary carcinoma from healthy tissue using *ferrum cardens* to stop the bleeding and to destroy the residual neoplastic tissue. He quotes *Leonides* as saying,

... placing the patient in a recumbent position, I make an incision into the sound part of the breast, above the cancer and immediately apply the cautery until an eschar is produced to stop the bleeding. Then I make another deeper incision and again sear the parts. Thus I proceed, cutting and burning alternately in order to restrain the bleeding. So doing, there can be no danger of hemorrhage. (When) amputation of the mamma is completed, I sear the parts until they are quite dry. The first cauterizings are made for the purpose of arresting hemorrhage, but the rest with the intension of irradiating the disease.'

It is notable that *Leonides* was the first to describe nipple retraction as a clinical sign of breast cancer.

Galen (138, 164) (131–203 AD) described the removal of the breast by surgery and the use of cautery in some cases:

'In all operations we attempt to excise a pathologic tumor in a circle, in the region where it borders on healthy tissue. When the breast tumor is cut out all around, there is danger of hemorrhage, which if restrained by ligature, might occasion a recurrence of the disease in the adjoining parts, whereas, if cauteries be used to burn the roots of the vessels, no great danger is likely to result from their being so near to vital parts.'

(This would seem to be an attempt to decrease the tendency of tumor recurrence.) He also states that 'cancerous tumors are found in all parts of the body,

but particularly in the breast of women, after the cessation of menstruation, which so long as it is regular, preserves good health'. *Paulus of Aegina* (49) (7th century AD) mentions the frequency of breast cancer in females and its poor prognosis. The writings from the Coptic language of the Egyptian Christians on a short fragment found in the monastery at Deir-El-Abida includes prescriptions for the treatment of disease of the breast (44, 331).

It is, therefore, apparent that men of early civilization were aware of, and attempted to solve, the problem of breast cancer. This consisted of invocations to the proper deity, internal medicines, local applications, removal of the tumor, removal of the breast or radical removal of the breast and adjacent tissues. All of which failed.

During the Dark Ages, physicians were primarily concerned with the ancient canons of the medical arts. These concepts were based on the teachings of *Hippocrates* and *Galen*. The Empiricists of that time followed them with unbending fidelity. After the Council of Tours in 1162 (78), the church frowned upon the use of surgery in the treatment of cancer of the breast. As a result of these circumstances, the progress of medicine in Europe was nearly halted.

It remained for the Arabians to carry on the progress of medicine (73). For example, *Abu'El-Quasim* (11, 244) (*Albucasis*, 1013–1106 AD) was among the greatest surgeons of Islam. He wrote *Al tasrif* ('The method', an Encyclopedia of medicine and surgery in 30 books or sections). The last book, *On surgery*, was the first independent work on surgery and the first illustrated surgical treatise there was on cautery. He used cautery for the treatment of cancer. *Guy de Chauliac* (69) (1300–1367), 'Restorer of surgery', the person who played a significant role in the reintroduction of surgical techniques in Europe, quotes *Abu'El-Qasim* over 200 times. *Abu'El-Qasim* was very pessimistic about the value of surgery in the management of breast cancer: 'If the cancer lies in a locality where it can be grasped in toto like the mammary gland and especially if not fully developed, operation may be attempted.' He laments: 'As for me, I have never been able to cure a case nor have I known one who has.'

Nevertheless, the surgical treatment of breast cancer continued to be used in varying forms and techniques. *Lanfrank* (126, 222) (?–1315 AD) removed breast cancer using the same technique as his predecessor, *Leonides*, had used more than 1,000 years previously. *Henry de Mondeville* (260) (1260–1320) advocated a deep incision, excision and cautery for small cancers. He used arsenic and zinc chloride caustic pastes as the treatment of choice in large cancers. Wide excision of operable tumors was advised by *Guy de Chauliac* in the *Chirurgia magna* (69).

Physicians through the ages have not been lacking in their zeal to attack breast tumors. *Francisco Arceo* (18) (1439–1571) divided the cancerous breast lengthwise and attempted to dissolve the tumor by means of a ligature. *Leonard*

Fuchs (136) (1501–1566) compressed cancers of the breast by means of lead plates. *Ambroise Paré* (279) (1510–1590) was a Galenist and conservative in the treatment of the cancerous breast. For a small, non-ulcerated cancer situated in the region where it could easily be removed he treated by excision of the tumor well beyond its boundaries, and cauterized the base with vitriol. He also tried to treat by compressing the base of the breast with lead plates. He treated large ulcerated tumors with sweet milk, vinegar and ointments. He was among the first to note the importance of axillary involvement in breast cancer. *Andreas Vesalius* (352) (1514–1564) treated breast cancer by wide excision and used ligatures to control bleeding. *Hieronymus Fabricius ab Aquapendente* (115) (1537–1619) performed extensive surgery for cancer only at the patient's request. He felt that partial excisions were of no value. *Jacques Guillemeau* (205) (1550–1601) removed the breast and the pectoralis major muscle when treating breast cancer. *Marcus Aurelius Severinus* (329) (1580–1659) radically excised the breast and was one of the first surgeons to remove axillary nodes at the same time. *Fabricius Hildanus* (78, 186) (1560–1634) also removed mammary carcinomas and the axillary contents. *William Clowes* (364) (1560–1634), physician to Queen Elizabeth, recommended the laying on of hands. Many came to Queen Elizabeth to be touched by her; it was not an unusual practice of that time to receive a touch by a royal person as treatment for certain disease. *Peter Lowe* (237) in 1597 recommended the application of goats dung. *James Cooke* (77) (1614–1688) advised bleeding from the vena basilica. Recommendations of the time included the use of live frogs or chickens cut in half and layed on the tumorous breast, or the fresh carcass of various other animals was applied to the tumorous breast.

Sculetus (327) (1595–1645) describes his procedure of removal of breast tumors: 'Heavy ligatures were passed through the base of the breast and traction was applied as the breast was swiftly amputated. Bleeding from the operative site was quickly seared with a hot iron.' Other methods (317) of operations during the 17th century included the removal of small tumors of the breast by dissecting it out. If the entire breast was involved, the breast was caught up by an assistant with either one or both hands and was held up from the chest wall while the surgeon removed it. Or, the breast was held firmly by a clamp of metal over the shoulder attached by a thumb screw to two semicircular clamps surrounding the breast. These two semicircular clamps were brought tightly together and locked in position. They, therefore, served as a guide for the incision. A sharp knife was used to remove the breast. The vessels were allowed to bleed 2–4 ounces of blood. Then lint, saturated with hot beer in which had been dissolved a piece of butter, was applied to the bleeding surface. The area was then covered with a compression bandage.

Reverend *John Ward* (305), in 1662, observed a breast cancer operation performed by two surgeons of his time:

'First, they cut the skin across and layed it back, then they worked their hands in it, one above, the other below, until their hands met and so brought it out. They had then needles and wax thread ready, but never used it, and also the cauterizing irons, but they used them not. She lost not above 6 ounces of blood in all.'

After having removed the tumor, the next day they opened the breast again and cut off bits of residual tumor, and put in a glass of wine and some lint and then waited until the next day. They again opened it and injected myrrh, cloves, aloes and 'such things as resist putrifaction' and closed it again. Everytime they dressed it, they cut off some of the cancer that was left behind. Some of the surgeons present apparently wanted to use caustics, but one surgeon felt that she could 'endure the knife'. He then prepared her by giving her purges and letting her blood. 'She endured it with infinite patience all along, not offering to lay her hand upon it, but a warm cloth to the other breast all the time. One of the other surgeons told her afterwards that she had endured so much that he would have lost his live ere he would have suffered the like' (305).

The operation was not successful because a few months later Reverend *Ward* writes: 'Mistress Townsend of Alveston being dead of cancer, Mr. Evers and I opened her breast in the outward part and found it very cancerous' (305)

Laurentius Heister (205) (1683–1758) not only removed the pectoralis major, but would resect ribs in cases in which there was invasion. *Henry François leDran* (225) (1685–1770) considered cancer to be a local disease in its early stage and its method of spread was by lymphatics to the regional lymph nodes.

Jean Louis Petit (289) (1674–1750), in his description of the surgical treatment for cancer of the breast, felt that the roots of the cancer were the enlarged lymph nodes. His feeling was that these glands should be searched for and removed along with the pectoral fascia and, if necessary, the fibers of the muscles itself should be dissected rather than leaving behind disease. He warned against cutting through the mammary gland during the operation. (It was another 100 years before this was routinely heeded.) His intent was to cure rather than purely remove the cancer. He stresses the necessity of careful and thorough examination of the axilla to determine its status before beginning the operation. If the patient had a small lesion that was removable and occupied 'but one part of the breast', the patient was positioned for surgery by being placed in a high chair with the arm on the affected side held down and extended so that the pectoral muscle could be separated from the diseased breast. A crucial incision was made through the operative area, the cancer was then freed from the normal tissue by putting a ligature through the diseased tissue, and he was able to lift this from the operative area and, if this were not possible, a hook was used. He stressed the necessity of removing the surrounding normal tissue and the tumorous breast together in one piece. After the operation, the wound site was allowed to bleed a few ounces depending upon the health of the patient. He did not apply cautery to stop the bleeding, but allowed the bleeding to stop on its

own accord. Occasionally, it was necessary to tie larger vessels. He then applied a quantity of scraped lint to the area and this was covered by a broad compression bandage. René Garengot (305) (1688–1770) carried on Petit's work. Some of Petit's work was thus included in Garengot's publication of his *Traité des opérations de chirurgie* published in 1720.

In 1708, Godefridus Bidloc (38), the Dutch anatomist and surgeon, illustrated in his *Anatomical and surgical exercises* a single- and double-pronged fork that he used for removing the breast. The breast was transfixed with either the single- or double-pronged fork, whichever was appropriate, and cut away from the pectoralis muscles with a sharp knife.

In 1773, Bernard Peyrilhe (364) (1735–1804) advised an operation that included the removal of the axillary and pectoralis major and the cancerous breast. This, in effect, was the same as the original operation proposed by Halsted (166–168).

Benjamin Bell, (305), describing an operation that he had done in 1772, indicated that he removed as little skin as possible and recommended that the breast be dissected off the pectoral muscle. He felt that particular care should be taken in dissecting all of the axillary nodes if any benefit was to be obtained from axillary dissection. He recommended removal of the entire breast, even in the face of a small lesion. Alexander Monro (262) (1773–1859) reviewed 60 cases of surgically treated breast cancer and found that only 4 were free of disease at the end of 2 years. During this time, Velpeau (238) questioned the value of major surgery, because of his high recurrence and mortality rate.

Many men like James Syme (341) (1789–1870) recommended wide excision and complete resection whenever possible. He felt that procedures such as cautery only partially destroyed the cancer and considered the knife or scissors the best approach for removing the disease. He also stressed the importance of removing the axillary glands. He made his dissection as wide as possible of the actual tumor.

A story written by John Brown (305) gives some insight into the endurance of the patients and the results of operations that were performed around 1820:

'The following day at noon the students came hurrying up the great staircase. The operating theatre is crowded. The surgeon with his staff of assistants is there. In comes Alice, one look of her quiets and abates the eager students, that beautiful old woman is too much for them, these rough boys feel the power of her presence. She walks in quickly but without haste, dressed in her mutch, her neckerchief, her white dimity shot gown and her black bombazine petticoat. Alice stepped up on a seat and laid herself on the table as her friend the surgeon told her, shut her eyes, rested herself on me and took my hand. The operation was begun at once. It was necessarily slow and chloroform – one of God's best gifts to his suffering children – was then unknown. The surgeon did his work. The pale face showed its pain, but was still and silent. – It is over; she dressed, steps down gently and decently from the table, then turning to the surgeons and the students she curtsies and in a low clear voice begs their pardon if she has behaved ill.'

The story goes on to tell how within a few days she dies of overwhelming infection.

Because of the lack of antisepsis and asepsis, infection, rather than surgical technique as implied by most modern surgeons, was probably the major cause of the appallingly low post-mastectomy survival figures of that day. The second was probably the lack of technological support during and after the surgery. The third was patient selection and only the fourth being the operative procedure.

Robert Liston (236) (1794–1847) believed that the surgeon should perform an operation for breast cancer only under optimal conditions. When axillary nodes are involved, he writes: 'No one could now be found so rash or cruel as to attempt the removal of glands thus affected whether primarily or secondarily.' In 1853, *Sir James Paget* (276) (1814–1899) wrote: 'We have to ask ourselves whether it is probable that the operation will add to the length or comfort of life enough to justify incurring the risk for its own consequences.' He had an operative mortality of 10 % in 235 cases. *Sir James Paget* demonstrated his enormous ability of observation and prophetic insight when he writes: 'In deciding for or against the removal of the cancerous breast in any single case, we may, I think dismiss that the operation will be the final remedy of the disease.' *Hayes Agnew* (9) (1818–1892) could not find among his large series of treated cases a single cure. Like *Sir James Paget* he did not expect surgery to be the answer to the breast cancer problem. 'I do not despair of carcinoma being cured somewhat in the future, but this blessed achievement will, never be wrought by the knife of the surgeon.'

Thomas Bryant (305), assistant surgeon at the Guy's Hospital in 1865, recommended that the entire breast be removed in addition to as much skin as possible. This was a reflection of the trend of that time, that is, to remove at least the entire breast. It also represented the even deeper underlying trend toward removal of more and more surrounding tissue.

Thus, for over 100 years, surgeons had been recommending the simple mastectomy. Their results might have been as good as those of today if they had had the support of antisepsis, asepsis, antibiotics and modern operative technology. The advocates of radiation therapy might hasten to add that irradiation might have helped to improve survival and most certainly decrease the recurrence rate.

In the mid-1800s, surgeons were greatly concerned with recurrence, since recurrence rates ranged as high as 80 % in the operative site. *Charles Moore* (264) of the Middlesex Hospital set out to discover why recurrences took place after an operation. He felt that the main reason was fragments of tumor being left behind either in the breast or in adjacent tissues. It is this theory that has led surgeons, before his time and after him, on toward greater and greater achievements in the amount of breast and adjacent tissue removed. And today, it has spurred physicians to advocate the ultimate by treating the entire body through

the use of systemic therapy, either by chemotherapy, hormonal therapy, or immunotherapy.

In his paper published in 1867, entitled *The influence of inadequate operations upon the theory of cancer*, Moore (264) presented the basic foundation and principle of the radical mastectomy, except for one step, that is recommending the *routine* excision of the pectoral muscle. He recommended: 'in the performance of the operation it is desirable to avoid not only cutting into the tumor, but also seeing it. No actually morbid structure should be exposed lest the active microscopic elements in it should be set free and lodge in the wound. Diseased axillary glands should be taken away at the same dissection as the breast itself, without dividing the lymphatics; and the practice of first roughly excising the central mass of the breast, and afterwards removing successive portions which may of doubtful soundness, should be abandoned. Only by deliberately reflecting the flaps from the whole mamma and detaching it first at its edge, can the various undetected prolongations of the tumor and outlying nodules be included in the operation.'

'When any texture joining the breast is involved in or even approached by the disease, that texture should be removed with the breast. This observation relates especially to skin, to the lymphatics, to much fat, and to the pectoral muscle.' (Here Moore is recommending the elective removal of the pectoral muscle, rather than its *routine* removal.)

In the United States, the first published accounts of breast surgery appeared in the Boston Gazette, No. 50, November 21-28, 1720; it is believed to be one of the earliest operations for cancer performed in the Colonies (102). The surgical procedures in the United States for the next century merely reflecting what was being done at the centers in Europe.

In the case reports of Massachusetts General Hospital, there is a description of an operation in 1822 on a lady with a tumor of the breast. A semilunar incision from the axilla to the sternum was made. A similar incision was made above the nipple, and a third of the breast was removed as well as some involved axillary glands. Subsequent case reports from the Massachusetts General Hospital in 1825 (102), indicates more breast tissue was being removed. This operation was similar to the 1822 reports from this hospital, except that the entire breast and axillary nodes were dissected out.

Joseph Pancoast (277), Professor of General Descriptive and Surgical Anatomy at the Jefferson Medical College, described in 1844 a procedure for removal of breast cancer. The patient was seated in a chair and the tumor mass and the axillary nodes were removed intact. Apparently, he did not divide the pectoral muscles in dissecting the axilla.

Pancoast was followed by Samuel D. Gross (305) (1845-1886), a Professor at Jefferson, who advocated a less extensive procedure and recommended that as much of the surrounding normal tissue as possible should be preserved in order

to effect a completed closure of the wound. He did not emphasize the removal of the axillary glands. *Gross*' son, *Samuel W. Gross* (152), advocated a more complete operation. He succeeded his father as Professor of Surgery at Jefferson Medical College. He strongly supported *Charles Moore*'s doctrine on the type of surgical procedure for breast cancer (152). He too concerned himself with causes and sites of recurrence following breast cancer surgery. He, therefore, recommended and performed an operation similar to that of *Moore*. In his operation, the patient was placed in a recumbent position with the affected side slightly elevated and the arm held off at right angles to the body. Incision was made through the skin to the fascia of the pectoralis major, then the surgical excision was carried around the entire breast. If the mass was attached to the pectoral fascia, this was removed along with the breast, then dissection was carried up towards the axilla removing any axillary breast tissue. At the same time, he examined the muscles of the chest wall and the costocartilages and removed any nodules which might be present. The dissection of the axilla was carried along the lower margins of the pectoralis major muscle, using mostly the fingers to dissect out any axillary growth. The pectoralis muscle was removed only if involved.

Von Winiwarter (355) reported the results of treatment of mammary cancer in *Billroth's* Clinic in Vienna during the period of 1867–1875. The surgical procedure ranged from partial excision of the breast to radical mastectomy with removal of the axillary nodes. His 3-year survival was 47 %. *Poulsen* (303, 304) in 1890 published the results from Copenhagen City Hospital covering the period of 1870–1888. In the majority of cases, the procedure was mastectomy, usually accompanied by extirpation of palpable axillary lymph nodes or complete axillary dissection. In some cases the pectoral fascia was removed. His 3-year survival was 20 %. *Volkman* (353), in 1875, removed the entire breast, a liberal piece of skin and carried his incision down to the pectoral muscle and dissected the breast off the muscle fibers. *Heidenhain* (183) supported *Volkman*'s work. His 3-year survival was 11 %. In 1889 he published the results of his studies on the spread of breast cancer cells. He indicated that portions of tumorous breast might be embedded in the pectoralis major muscle and thus left behind to cause a recurrence, if only the breast proper is removed. He, therefore, advocated complete removal of the pectoralis major muscle in all operations for cancer of the breast. Here is a surgeon advocating the routine use of the classical radical mastectomy. In practice, the operation that was commonly called 'Heidenhain's' consisted of removal of the pectoralis major fascia and superficial muscle layers. *Halsted* was aware of this work because he alluded to it in his original publication. He was also greatly influenced by the German medical literature of that time (305).

Thus, *Halsted* (168) was not the first to remove the pectoralis major in doing a radical mastectomy. However, his publication recommending that the

pectoralis major should be removed *routinely* was accepted and utilized. In his first paper, *Halsted* dealt only with removal of the pectoralis major. He later incorporated *Willy Meyer's* (256) recommendation of removing the pectoralis minor at the time of surgery. The present-day radical uses the diagonal incision of *Meyer* rather than the elliptical or teardrop-shaped incision advocated by *Halsted*.

In 1570, *Bartholemy Carbol* (364), Professor in Montpellier, reported the cure of a woman aged 35 in which the pectoralis major muscle was excised and the wound sprinkled with vitriol. *Petit* (289) and many of his successors occasionally removed portions of the pectoralis muscle in cutting wide of certain malignant tumors of the breast. *Volkmann* and the Germans of that period not infrequently carried out total removal of the pectoralis major. In fact, *Joerss* (196) attributed the modern operation to *Heidenhain*.

Table 1 shows the survival figures before *Halsted's* time. The improvement following the use of the modern radical mastectomy has been attributed by many (78, 160) solely to this operation in that it is more adequate.

The complete radical operation was, therefore, a concept that was cultured, nurtured and developed over the centuries. Acceptance of this procedure came about after the publication of *Halsted's* work, even though many surgeons were aware of this operation and some performed it on an elective basis. This is further supported in that when one looks at the independent descriptions of the operations of *Meyer* and *Halsted* an overall background of similar concepts is suggested. The following quotation helps to emphasize this point: 'The remarkable similarity in technique of these two surgeons and more particularly the phrases employed in the statement of fundamental principles involved even to the use of italics, is definite evidence of there being a common source of the ideas expressed in these two almost simultaneous publications.'

Summary

It should be remembered that the early Romans, 1800 years before *Halsted*, may have performed some form of the radical mastectomy as we know it today. However, their case selection, surgical morbidity and mortality may have overwhelmed and obscured the value of the surgical procedure. The present radical mastectomy may have been better in *Halsted's* time than it was 1800 years before, solely because of selection and modern technology. This idea is even more appealing if one notes that since *Halsted's* time the results of the radical mastectomy have been improving moderately although the basic procedure has remained unchanged (85, 94). The criteria for selection of the operable case at an earlier stage of the disease and the technical support for performing the

Table 1. Results of surgery (1845-1974)

Author or surgeon	Year of publication or period covered	Number of patients	Survival in years, %				Recurrence %	Operative mortality %
			3	5	10	15		
<i>Velpeau</i>	up to 1854	167						19.0
<i>Oldenop</i>	1850-1878	229	11.7					10.2
<i>Lazarus-Barlow</i>	1858-1875	200					54.5	
<i>Bilroth (Von Winiwarter)</i>	1867-1875	170	4.7				85	23.1
<i>Poulsen</i>	1870-1888	110	20.0					1.7
<i>Lüter</i>	1871-1880	53						7.5
<i>Fischer (Henry)</i>	1871-1878	147	9.0				75	20.4
<i>Klüster (Schmid)</i>	1871-1885	228	21.5				60	14.4
<i>Sprengel (Volkmann)</i>	1874-1878	200	14.0				59	5.4-7.6
<i>Schröder</i>	1875-1901		21.1					4.6
<i>König</i>	1875-1885	152	22.5				58-62	7.2
<i>Lazarus-Barlow</i>	1875-1895	230					39	
<i>Banks</i>	1877	46	20.0				-	
<i>Schmidt</i>	1877-1886	112	18.8				-	4.4
<i>Czerny</i>	1877-1886	102					62	
<i>Finsterer</i>	1877-1879	498	29.0					5.2
<i>Bilroth</i>	1877-1879	68						5.8
<i>Gussenbauer</i>	1878-1886	154	16.0				64	3.2
<i>Gross, S.W.</i>	up to 1880	485		(3.0)				
<i>Lücke (Dietrich)</i>	1881-1890	110	16.2				66	7.6
<i>Horner</i>	1881-1893	144	19.4					4.2
<i>Wunderli</i>	1881-1905	100	20.0					2.1
<i>Bergmann</i>	1882-1887	114	30.2				15-60	
<i>Guleke</i>	1882-1889	704	28.7					3.1

Schmidt	1884-1902	77	28.3			1.0
Joerss	1885-1893	98	28.5			
Mahler	1887-1897	150	21			1.3
Rotter	1887	109	27.1			
Curtis ¹	1888-1893	1,213	26.6			5.9
Halsted	1889-1894	50				
Halsted	1889-1898	133	52			24
Lewis and Rienhoff	1889-1931	950		18.1	4.1	25
Gebele	1890-1899		16.9			
Scheu	1890-1900		20.2			2.6
Steinthal	1892-1904	101	33.6	33.3		2.7
Pilcher	1894	23	35			3.5
Greenough et al.	1894-1904	97	29.5			
		160	16.0			77
Schwarzkopf	1895-1910	275	29.4	21.0		42.4
Lazarus-Barlow	1895					
Rosenstein	1896-1900		22.7			4.6
Rotter	1896	30	20.0			1.5
Schwarz	1896-1904		16.6			
Steiner	1897-1901	38	16.0			6.9
Dezner et al.	1898-1913	150	34.0	26.0		
Butlin and Maxwell	up to 1899	48	56.2			0.098
Judd and Siatrunk	1902-1912	510	44.7	39.8		
Morton	1902	39	31.5			0.049
Warren	1904	100	33.3			
Schwarzkopf (Ward)	1904-1911		27.7			5.5

¹ Summary of cases collected from European clinics.² Collective results.³ Negative axillary nodes.⁴ Positive axillary nodes.