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Interpretations of Amputation by Society, Patients and Surgeons

"Medicine, magic and religion are abstract terms, each of which connotes a large group of social processes, processes by means of which mankind has come to regulate his behaviour towards the world around him."

Rivers, 1924¹

"... it is no small presumption to Dismember the Image of God."

Woodall, 1617²

"... amputation should be performed only under circumstances when no other means will avail. The difficulties in determining these circumstances are often very great, and sufficient to perplex even the most experienced practitioner."

Fergusson, 1852³

From time immemorial, accidental severance has proved a "fait accompli," an immediate reality for unfortunate victims who, deprived of choice, are subjected to instantaneous loss when a limb is savaged by a crocodile, alligator or shark, struck by a cannonball, transected by railway wagon wheels, obliterated by a landmine (see Fig. 1.7) or wrenched off by entrapment in powered machinery. The immediacy and speed of these injuries diminished the apprehension and protracted pain associated with elective amputations before anaesthesia and, in minor cases at least, the suddenness of accidental section sometimes obscured instant recognition of an injury. Thus, a coal miner who lost a fingertip in a machine only became aware of his amputation when a companion fainted at the sight of blood, was concussed, and had to be assisted to the surface by the amputee. Survivors of such mutilations usually require treatment to

assist sound healing of the open stump, at which stage the patient has a choice for or against further action dependant on societal and personal factors. Any deliberate act of amputation, surgically performed or otherwise, relates to a variety of considerations determined by the victim or patient, their surgeon or surgeons, or by the attitude of the society to which they belong, but usually to a combination of these determinants of which society, through time-honoured rituals, religious convictions or scientific knowledge, may prove the most important. Indeed, unless society approves, elective amputation will be forbidden, irrespective of surgical advice, or even the patient's desire to avoid death.

Society

We have argued (see Chapter 2) that various societies recognised and accepted nonsurgical amputees long before surgical amputation was considered or attempted, although not all societies have undertaken amputation, as Harley indicated when studying the Mano tribe in remote Liberia:

*"... surgery is limited to bone-setting, blood-letting by shallow incisions, circumcision and scarification by tribal marks on the skin... instruments are ordinary household utensils..."*⁴

Similarly in 1877, Gordon observed:

*"... among the Burmese the surgeon, even in the oldest and lowest acceptance of the word, does not exist, and there is not the faintest knowledge of anatomy... They use no knife or instrument of any kind."*⁵

We assume Gordon was recording his experience in the remoter areas of Burma and not in major cities. Whether these societies undertook ritual or punitive amputations is not stated although, as suggested earlier, some knowledge of the physical imperfections of accidental amputations must have been acquired, if only at a digital level. It may be surviving amputees were found alien to some societies and rapidly dispatched, as probably happened to crippled members of hunter-gatherer communities or nomadic tribes, when no longer able to keep up with their fellows or fulfil a positive role in a harshly competitive environment. Within historic times, we have considered evidence that weak or crippled infants were judged useless to the Spartan state and thrown into a ditch (see Chapter 1). Such attitudes doubtless applied to congenital amputees but we cannot be sure how surviving amputees after trauma or disease were viewed, especially if previously contributing positively to their tribe or family group, particularly if a community leader or chieftain. Even societies that refused amputation entirely might accept accidental loss, as Daniell discovered when visiting Old Calabar in the Bight of Biafra (now Calabar, Nigeria) in 1849:

*"The people of this town manifest the most decided aversion to the performance of any surgical operation, and so strong is their abhorrence of amputation, that they would rather suffer death than any loss of an extremity. When, however, any portion of the limb has been taken off, either by alligator or ground-shark, they check the haemorrhage by applying a hot piece of iron, which has sometimes been of permanent benefit."*⁶

It may be that peoples dependant on gruelling and continuous work to subsist knew instinctively that amputation would restrict efforts to support themselves, rendering them a serious drain on others. In 2005, the massive earthquake centred on Kashmir highlighted the position of isolated mountain people, especially in Pakistan, dependant on their own resources and hard physical labour for survival. Commenting on much delayed treatment, due to communication difficulties, of those injured with grossly infected wounds in need of amputation a newspaper report stated:

"Pakistan is a country without a safety welfare net, and in its remote northern villages physical disability is often a worse fate than death. For poor subsistence farmers

scraping a living from the harsh mountains, a dependant who cannot work is seen as a huge liability." To emphasise this, a husband said of his injured wife, a candidate for amputation: *"I will not permit this. I will let her die than allow cutting her arm. She would not be able to work anyway."*⁷

Ultimately, it is apparent amputees were accepted by many societies, possibly promoted by their survival after accidental loss, or punitive and legal severance ordered by the self-same societies, to designate community outcasts as prisoners, slaves, trespassers or criminals, or participants in tribal rituals, and also as a warning or reminder to others. In these latter cases, victims were denied choices either for or against loss of their limbs or digits, as society monopolised all decision powers impelled by punitive, ritualistic or religious convictions; moreover, those who performed the actual punishment and severance, as pseudo-surgeons, also had no choice but to obey higher authority. Such profound societal convictions continue in some Islamic states where Sharia law punishes thieves and prisoners by amputations, although often these are now undertaken under anaesthesia by trained surgeons, as described in Chapter 4 when, in 1999, a prisoner of war of the Taliban underwent hand and foot amputations by a surgical team before a large crowd in a football stadium. In contrast, the same Muslim states often forbid elective surgical amputation for injury or disease, believing this renders the human frame imperfect for burial and precludes its ascent to Paradise. Even in the presence of mangled lower limbs following antipersonnel mine explosions, Coupland, working for the International Red Cross, confirmed in 1992 that Muslim religious practices to avoid surgical amputation have to be respected.⁸ Also in the 20th century, Hilton-Simpson noted Berber tribesmen isolated in the Atlas Mountains of Algeria frequently undertook skull trephination, yet never surgical amputation which was completely taboo; indeed, Hilton-Simpson recorded the enormous pleasure of Berber practitioners when compound limb fractures healed after many months of expectant treatment and after discharging much dead bone to leave a short, weak, barely functioning limb.⁹ Yet, lacking knowledge of antiseptic and aseptic surgical techniques, this was doubtless the safest course, at least for the surgeon, although else-

where modern amputation techniques would have provided sound working stumps and satisfactory prostheses with a more-certain return to early activity and employment.

Of the many ritual amputations recorded (see Chapter 4), most concern the fingers of females, principally in Africa, North and South America, India and New Guinea. It can be supposed adults assigned this mutilation had little choice in the matter but at least understood long-established tribal magic and custom in acquiescing to their loss, unlike the small girls of the Dugum Dani tribe of New Guinea subjected to finger amputations with a stone adze, without anaesthesia, in 1961, whose state of mind is difficult to imagine, even if told their sacrifice was to placate the ghost of a blood-related tribesman killed in battle (see Fig. 4.2). One must emphasise such guillotine amputations healed very slowly and often badly because of bone infection and necrosis leaving poor fragile scars, and yet, such sacrifices were frequently multiple over a period of time, resulting in the loss of several or even all fingers. The rationale for finger amputations included the following: to indicate a sign of mourning, to secure an eventual peaceful death, to prevent further deaths when these were numerous in a family, to avert serious illness, to indicate a widow's second marriage, to facilitate the making of fishing nets by removing the ring fingers, to celebrate the achievement of manhood, or to indicate a self-inflicted penitence towards a hierarchy such as a gangster mafia, or to participate in a religious act, a political protest or an insurance scam.

In those societies eventually accepting elective surgery, most prominently in Renaissance Europe, the debate surrounding intervention or not was essentially between patient and surgeon, although their communication involved inevitable overtones of religious, cultural and traditional attitudes, influenced by Catholic Church decrees rejecting deliberate operation and bleeding which prevented instructed priests from contributing to medical and surgical care as hitherto. And in Europe, the earliest accounts of elective amputation all expressed the need for patients or surgeons, but usually both, to pray or go to church for confession before the operation.

Thus, Von Gersdorff counselled in 1517:

*"If the limb must be cut off, and nothing else will help, . . . you should advise the patient above all to go to confession. and receive the Holy Sacrement on the day before you amputate. And if the surgeon hears Mass before operation, God will favor his work."*¹⁰

Von Gersdorff's illustration of an amputation scene (see Fig. 1.5) shows a spectator who has a dressing on his left hand suggesting amputations of his fingers, but who is wearing the emblem of a cross at his neck, emphasising the importance of religion to Gersdorff. Ryff's illustration of about 1545 (Fig. 9.1) is even more explicit, picturing a priest, prayer book in hand administering to the patient during surgery. In 1596, Clowes reminded his surgical readers that when performing amputation:

" . . . through the assistance of almightie God, you shall luckily accomplish this worke, by your good industry and diligence," And their patients: *" . . . have ministered unto them some good exhortation concerning patience in adversitie, to be made by the minister or preacher. And you shall likewise advertise the friends of the patient, that the worke which you go about is great, and not without danger of death."*¹¹

Here Clowes reminds us that operative death could be attributed by society to the surgeon, irrespective of the patient's original condition, and hence it was essential to warn the relatives. Whether legal actions or sanctions followed at this time is not clear, but at least a surgeon's reputation and capability would be suspect. No evidence indicates that surgeons faced the penalty of losing a hand for their operative failure, as noted when we discussed the Code of Laws established by Hammurabi in ancient Babylon (see Chapter 4). However, Kirk hints at a society's retribution when composing a medical report on the Kingdom of Shoa, Abyssinia, in 1843. When asked for his opinion on a boy with a grossly ulcerated tibia and an ununited compound fracture near the knee joint, he told an officer of the King's household that amputation offered the only chance of saving his life, to which the horrified official replied:

*"If you succeed you will get no credit by it, people will say it was the will of God; if the boy dies, they will say you killed him and you will have much trouble."*¹²

In the 20th and 21st centuries, surgeons found guilty of operative negligence by society (their

FIG. 9.1. Amputation scene showing patient supported by a priest, his surgeon and apprentice, by Walther Ryff, 1545. "Tourniquets" appear to be applied above and below the amputation site, and two knives, a bow saw, needle and thread, sponge and dressings are seen. (From Gurlt E. *Geschichte der Chirurgie*, vol 3, Berlin, Hirschwald, 1898:49.⁴⁰)



peers and the courts) lose their status and employment but not their lives. Patients are now well protected by society and its legal systems, which enable examination of the facts through a succession of court appeals if necessary.

In addition, society also had cultural restraints associated with ancient astrological superstitions, as Woodall indicated in 1617 when speaking of amputation and the necessary instruments (Fig. 9.2).

*"All these necessities as is said made ready to the worke, in the name of the Almighty, the sharpe instruments being as neere as you can hidden from the eyes of the patient. . . . This worke of dismembering is best to be done in the morning, doe it not willingly the signe being in the place, neither the day of the full moone, . . ."*¹³

Woodall suggested a practical note by operating in the morning during daylight, still available in the afternoon when complications might supervene. On the other hand, amputations after severe trauma required immediate action, irrespective of

the quality of the light or the phase of the moon. Towards the middle of the 17th century, admonitions advising patient and surgeon to pray or confess, or to adhere to astrological directions, disappeared from European surgical texts.

Earlier discussion has noted that not all societies countenance elective amputation, including those in Saudi Arabia, parts of Nigeria and Afghanistan when under the Taleban (see Chapter 4) who are guided by Sharia law, a code for human existence, including daily prayers, fasting and donations to the poor, but also a code dictating physical punishment for crimes including flogging, stoning and amputation. Yet, the same societies forbid or disapprove of amputation for medical reasons, believing it an interference with the wholeness of the human corpus, precluding ascent to Paradise. Coincidentally, in some Islamic countries practising legal amputations, many innocent victims have been seriously injured in recent years by antipersonnel mines, designed to blow off the foot, posing difficult choices for

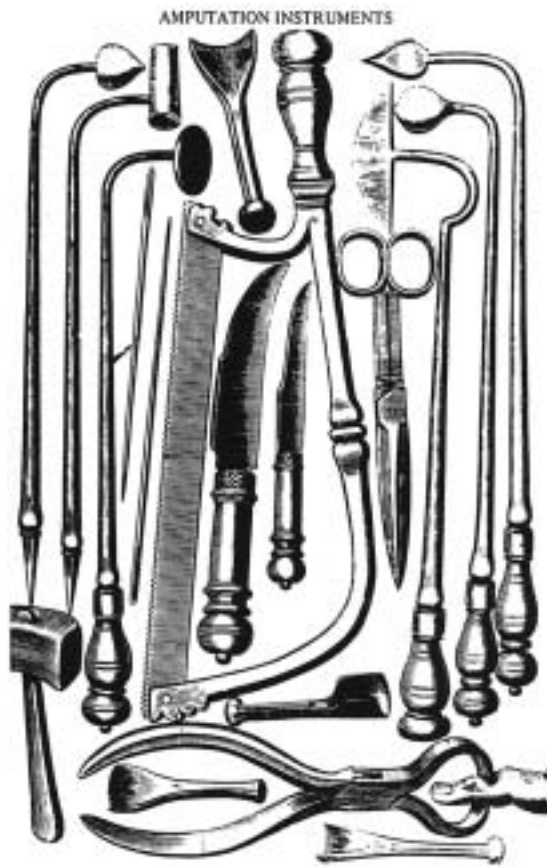


FIG. 9.2. Amputation instruments from 1639; these are of relatively simple construction, including a very modern form of scissors. Woodall offers a wide range of cauteries and chisels with a mallet. (From Woodall J, *The Surgeon's Mate*, London: Bourne, 1639.⁴¹)

patients and relatives, especially the parents of maimed children. Even so, as Coupland stated, Sharia views must be accommodated.⁸

Despite a general acceptance of amputees into the community, they, as do other handicapped citizens, often met and continue to meet bias and misguided intolerance, as Thomas and Haddan reminded us in 1945:

"The amputee often experiences great anxiety as to this attitude towards his disfiguring handicap and usually dreads the ordeal of returning home and having to face family and friends. The malevolent influence of the unreasoning prejudice of society towards a physical defect is well known and must be faced realistically and with courage by the amputee . . . Not pity, but a sympathetic understanding and helpfulness are what is desired.

*Assistance should be rendered only when requested, the amputee being given every opportunity to be as independent as possible . . ."*¹⁴

For lesser amputations of fingers and toes, toleration by the community is more evident, and indeed such amputees may lead a normal existence without apparent physical handicap, especially if only a single digit has been lost, for adaptation and reeducation of the hand may be remarkable, as a colleague's history confirms. He lost his left index finger in an accident at the age of 4 and subsequently played the piano, passing the Teacher's Certificate at the Royal Academy of Music, and later became a consultant orthopaedic surgeon performing major operations demanding bimanual skill and control until normal retirement; he has observed his left middle finger is thicker than on the right, although he is right-handed.¹⁵

Patients

The victims of congenital deficiencies, acute accidental limb severance and of punitive, legal and many ritual amputations have no opportunity to express their wishes in the matter, in contrast to the majority of patients faced with less concrete situations where there is opportunity to debate their future with surgeons, relatives and friends. By contrast, victims who are trapped alone and without communication or aid have to make a choice for or against amputation without advice, relying only on their knowledge and a veneer of traditions inherent to their own society. The trapped victim in extremis and desirous of survival who performs an amputation acts as both patient and surgeon. Repugnant as such actions appear to the average citizen, the instinct to survive remains powerful despite self-inflicted excruciating pain and uncertain immediate complications. Such self-amputations have been reported with some regularity in the press, proving less rare than may be imagined (see Chapter 3).

In somewhat similar frame of mind and desperation, we note injured or diseased patients who clamoured for a surgeon, demanding or indeed insisting on immediate limb amputation. In

particular, from close observation of wounded comrades, many soldiers and sailors recognised no other course was possible and moreover were aware that delayed amputation was more painful. Wiseman emphasised these points, about 1658, as follows:

*"... a Walloon earnestly begged me to cut off his shattered Leg: which whilst I was doing, he cried, 'Hurry up when we're back on land we'll have a drink'. Also others have urged me to dismember their shattered Lims at such a time, when the next day they have profest rather to die. ... Therefore you are to consider well the Member, and if you have no probable hope of Sanation, cut it off quickly, while the Souldier is heated and in mettle. But if there be hopes of Cure, proceed rationally to a right and methodical Healing of such Wounds: it being more for your Credit to save one Member than to cut off many."*¹⁶

Another sailor's sangfroid is recorded by Ryder in 1685:

*"... upon the Recoil of a Gun the Truck ran over his Foot, breaking in pieces all the Bones of the Metatarsus: perceiving his Foot very much tumefied and discoloured above the Ankle, I made deep Incisions on the Tarsus, and Metatarsus, which he felt not; I told him there was a necessity to take off his Leg, to which he readily agreed; so he hopp'd on one Leg to a Chest where sitting I took it off, (he not expressing the least sign of pain or sorrow."*¹⁷

"Heated and in mettle" is a 17th-century description of the body's immediate response to injury when boosted by high adrenaline levels, bolstering a courageous acceptance of surgery but which diminished as levels returned to normal and as the wound began to swell and inflame. Earlier we noted the elated sailor who sang "Rule Britannia" during his amputation.¹⁸

For more-chronic conditions such as dry gangrene and persistent fracture non-union with chronic pain, purulent discharge, loss of weight, sleeplessness and immobility, it is apparent courage of a different kind is manifest. We have already recorded the remarkable determination of a boy, aged about 9, with severe chronic leg complications after crushing by a cartwheel a year previously. Reduced to a skeleton with 11 discharging fistulae and his health fading fast, he insisted on removal of his useless limb, saying to the surgeon:

*"... he knew he should be well, if I would cut off his Thigh: and that if I would lend him a Knife, he would cut it off himself; ..."*¹⁹

He remained remarkably composed throughout a successful amputation. In drawing attention to the incredible cooperation of some children faced with major operations without anaesthesia, Stanley quoted an observation recorded in 1819. A 7-year-old boy with a diseased knee joint came under the care of Abernethy, a London surgeon, who said:

"I suppose, my little fellow that you would not mind having this knee removed, which pained you so much and made you very ill?" The boy replied, *"Oh no, for mammy has told me that I ought."*²⁰

During the amputation, the boy remained quiet and displayed neither hesitation nor opposition. Here perhaps the influence and encouragement of the parent were paramount. At the other end of the age range, Sir James Lowther, aged 77 years in 1750, asked for a below-knee amputation for gout complicated by infection and bone necrosis in the foot after years of misery, which he:

*"... submitted to with his own peculiar calmness and resolution without the least tendency to faint under the operation ..."*²¹

He lived for another 5 years and wore a below-knee prosthesis. In general terms such patients have reached the end of their tether, perhaps realising that anything would be better than the unremitting pain, persistent discharge, rotten odour, immobilisation, general fever, loss of appetite and weight, and an instinctive recognition that death approached relentlessly. In 1706, Edward Thwaites, who became Professor of Greek at Oxford, consulted Charles Bernard, surgeon in London, with a constantly painful tuberculous knee (the King's Evil), and when the surgeon demurred amputation, Thwaites said:

"I came to London on purpose to have my leg cut and off it shall go: and if you will not do it, lend me your tools and I will do it myself."

It is reported he would not suffer himself to be tied down and during the whole operation made no sound. He recovered to die 5 years later when the disease spread to his lungs.²² This is not to imagine that every patient had the courage to hazard the uncertainties of a major operation before the days of safe surgery. However, those surviving were often relieved. Also in the 18th

century, Petit recounted the case of a boy who had been ill with caries of a leg and infected fistulae keeping him awake for 2 months; the night of the amputation he slept soundly and this continued till after his stump healed.²³

The rapid progression of infected gangrene from the foot or hand towards the trunk was another reason for patients to demand immediate amputation. For dry or slowly established gangrene, the prospect of living with a black, functionless, foul-smelling limb into an uncertain future gave time for reflection, yet also proved a persuasive reason for accepting amputation. Similarly, the relentless growth of a tumour, especially if hindering mobility and work, has persuaded patients to ask for surgical excision or in extreme cases acceptance of limb sacrifice, even in the absence of pain as recounted by Peirce in 1737. A farmer's son, aged 25 years, complained of a swelling which enlarged over 8 years, ultimately preventing him working from the time "of Hay-Harvest 1735" (Fig. 9.3). It is clear the size and weight of what was probably a cartilaginous tumour near the right knee would have prevented a normal gait, or even a comfortable sitting or sleeping posture, and its continuing growth presented a frightening prospect for the patient. Peirce states the lower thigh stump healed but does not tell us whether the patient had an artificial leg or resumed work.²⁴

A more urgent demand for amputation relates to the victim's entrapment in a dangerous envi-

ronment with poor resources, as applied to the rescue of a Colonel of the Gurkha Rifles trapped by his arm in a crashed helicopter leaking oil from an overheated engine, in a remote area of the Malaysian jungle in 1964. A medical officer in the helicopter was unharmed although he carried no anaesthetic or surgical equipment. The victim, suspended by his crushed arm, and the surgeon had to be supported amidst the wreckage by a colleague whilst a difficult amputation lasting an hour was undertaken using a pair of socks as a tourniquet, a clasp knife, a bayonet and a fishing line for ligatures. As another example of sangfroid in extremis, the Colonel remained conscious and silent throughout, acknowledging the powerful effect of peer pressure in stating:

"I sensed that the Gurkha soldiers of B Company were now grouped around the wreckage. Bravest of the brave, how often had I seen their courage when wounded in battle. Now I had to try to live up to their standards, to show I was worthy to be one of their officers."

A successful operation enabled him to continue his career and become a Brigadier-General.²⁵

Sometimes patients initiate an amputation following dissatisfaction with a badly healed and painful compound fracture, or a painful and recurrently infected amputation stump, or a stump too long for an efficient prosthesis. An example of this, reported in the press in 2004, concerned a Royal Marine officer whose severe leg injury in a climbing accident eventually healed,

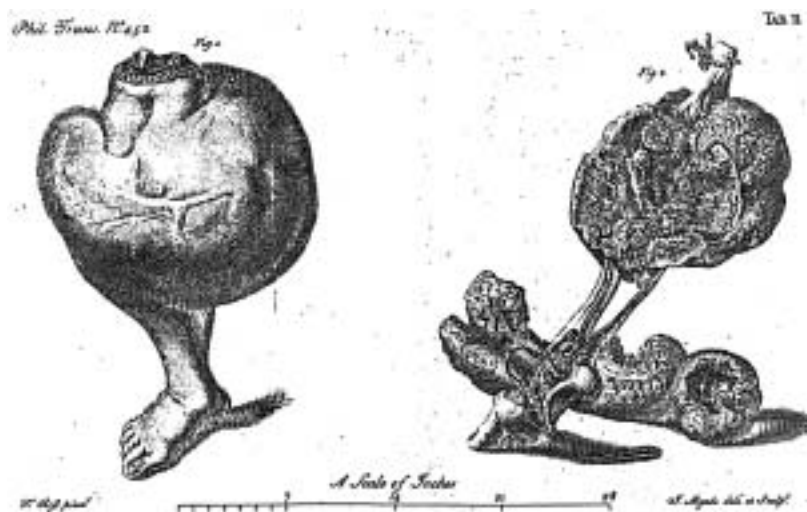


FIG. 9.3. Engraving of massive upper tibial tumour with its bony and cartilaginous skeleton, excised in 1736 by Jeremiah Peirce; he stated the amputated specimen weighed 69 pounds.²⁴

leaving him with poor function and a threat of retirement. He perceived a sophisticated artificial limb would improve his capacity and after surgery and rehabilitation was permitted to remain in the service fully active and, indeed, was enabled to join a polar expedition.²⁶ In the 16th century, Paré left the following account of reamputation of an overlong stump incompatible with the prostheses then available:

"For I so knew Captain Francis Clark, when his foot was stricken off with an iron bullet, shot forth of a man of War, and afterwards recovered and healed up, he was much troubled and wearied with the heavy and unprofitable burden of the rest of his leg, wherefore, though whole and sound, he caused the rest thereof to be cut off, some five fingers breadth below his Knee; and verily he used it with much more ease and facility than before in performance of any motion."²⁷

Cox wrote a complete monograph in 1845 concerning a woman of 23 years who asked for reamputation, after suffering for 14 years from an infected stump following an above-knee amputation for a diseased left knee joint. She submitted to amputation through the hip joint in 1844, shortly before general anaesthesia was available; Cox reported she drank half a bottle of port wine, although it is not clear whether this was before or after the operation, and subsequently survived with a well-healed stump (Fig. 9.4).²⁸

For many patients faced with an acute injury operation was totally unacceptable, perhaps more often than we can estimate, as such case observations of refusal are rarely described. However, for most patients matters were less clear cut, as their decision for or against amputation was not heightened by the acute shock of an injury or by chronic illness and relentless bodily sapping misery, but by less precipitate symptoms, for example, the gunshot wound treated conservatively until infection gradually spread or the chronic bone ulcer which dripped with pus and interfered with normal activity but was not life threatening. In these circumstances the debate between patient, surgeon and relatives might occupy days or weeks and, before general anaesthesia, persuaded many patients to refuse amputation and to live on in hope of recovery, however slim.

Wiseman described the instantaneous reaction of a soldier who received a musket ball injury of the elbow joint at the battle of Worcester in 1651; the humerus, radius and olecranon bones were all shattered and, at that time, open joint injuries were considered a clear indication for amputation. Wiseman commented:

"Upon sight whereof I called Will. Clarke (now a Chirurgeon at Bridgnorth) and other Servants about me, to cut off the Arm, and the while I endeavoured to encourage

FIG. 9.4. Elizabeth Powis, aged 24 years, showing healed scar after hip disarticulation in 1844 for a painful unhealed stump following above-knee amputation when aged 9 years, probably for tuberculosis.²⁸ (See Fig. 8.2)



*the Souldier to endure it. In answer thereto he only cried, Give me drink, and I will die. They did give him drink, and he made good his promise, and died soon after; yet had no other Wound than that. By which may be perceived the danger in delaying this work to the next day, when the aforesaid Accidents have kept them watching all night, and totally debilitated their Spirits.*²¹⁶

Duhamel highlighted the more-laboured quandary of a soldier in World War I who was struck in both knees by a grenade and required immediate amputation of one leg for massive injuries. The other less traumatised leg was treated conservatively for some weeks, but gradually chronic infection spread and his general condition deteriorated, for which a second amputation was advised. At first the soldier refused to consider this advice, despairing of a future without legs, work, marriage and children until, eventually, Duhamel convinced him independence was possible with artificial legs, and he was rescued by a second dismemberment above the knee. Both stumps healed and eventually he coped with prostheses, became a tax inspector, was married and had children.²⁹ Before the days of anaesthetics and antibiotics, it was even more daunting for patients with an inflamed wound who underwent an amputation which proved insufficient to cure their condition and were then advised to undergo further amputations at higher levels to avert spreading infection. Wheeler recounts this experience of a nurse working in a hospital attached to his Regiment, in the War of the Spanish Peninsula, in 1814 as follows:

*"... she pricked her finger with a pin left in one of the bandages, caught the infection, her finger was first amputated, then her hand, the sluff appeared again in the stump, she refused to undergo another operation, the consequence was she soon died."*³⁰

Beyond the decision to accept an amputation and its associated threats of immediate complications, the patient also had to accept, if all went well, inevitable deformity and disability, as manifest sources of future anxiety and misgivings. Even in the 21st century, as the Waterford Disability Network affirmed:

"Many people who have suffered the loss of a limb will go through a period of intense emotional turmoil and grief: they will suffer anger, depression and disbelief. On-going support from family, friends and medical profes-

*sionals is vital, and rehabilitation has to include both the physical and emotional needs of the person."*³¹

On a different note, some Muslim patients preserve their amputated limbs or limb remnants to be buried with them after death so they can go to Paradise whole. And on a related note, the preserved limb has been retained, in one instance at least, for public inspection and the victim's repeated pilgrimage, as the case of General Sickles reveals. Injured while on horseback at the battle of Gettysburg, his shin being shattered by a cannonball, he was evacuated with a saddle-strap tourniquet, smoking a cigar and drinking brandy. After a low-thigh amputation, the specimen was preserved and sent to the Army Medical Museum for display (Fig. 9.5). On recovery and retirement, Sickles preferred a pair of crutches to a prosthesis, and was in the habit of visiting the Museum regularly to view his loss (Fig. 9.6), often bringing

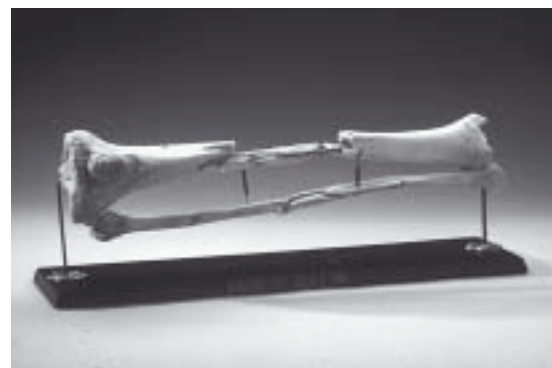


FIG. 9.5. Tibia and fibula of General Sickles amputated for injury by cannonball at the Battle of Gettysburg in 1863, demonstrating massive bone loss below the knee and an appropriate cannonball. (With permission of the National Museum of Health and Medicine, Washington, DC.)



Fig. 9.6. Engraving of General Sickles with an above-knee amputation, on crutches, examining his shattered leg on public display in the Armed Services Medical Museum.³² (With permission of the National Museum of Health and Medicine, Washington, DC.)

friends with him to admire the leg. Mark Twain, who was a neighbour, commented:

*"... the General valued his lost leg away above the one that is left. I am perfectly sure that if he had to part with either of them, he would part with the one he has got."*³²

Surgeons

We have argued that early societies probably rejected amputees and, until the latter were accepted by their fellows, no elective surgical amputation was possible. Once amputees were accommodated by society, study of the indications for and how to perform an amputation were possible. Unfortunately, before the introduction of gunpowder and the severe trauma of compound gunshot wounds, no case evidence has been found to support earlier operations designed to achieve a healed stump capable of tolerating a prosthesis.

During the 15th century, gunshot wounds of the limbs became increasingly common and, at first, created uncertainty among military surgeons due to ensuing complications such as gangrene and ascending infection, followed by death of the victim, in contrast to more-familiar and less destructive arrow wounds. Certain surgeons considered gunshot wounds were poisoned by the explosive powder, which was believed to blacken the wound margins, and suggested hot oil lavage as a countermeasure. With experience it was realised, firstly, the blackening was due to contusion of the soft tissues and, secondly, other factors were more important, particularly disruption of the main arteries to a limb and the inflammatory effect of in-driven and contaminated clothing, armour and other foreign bodies accompanying the passage of the missile. Paré, one of the first to recognise this, advised at the first dressing:

*"The wound must forthwith be enlarged, unless the condition of the part resist, that so there may be free passage forth, both for the Sanies or matter, also for such things as are sarced (sic), or otherwise, contained therein; such as are pieces of their Cloaths, Bombast, Linnen, Paper, pieces of Mail, or Armour, Bullets, Hail-shot, splinters, of Bones, bruised Flesh, and the like, all which must be plucked forth with as much celerity and gentleness as may be."*³³

However, if the limb was shattered and its blood supply compromised, or if it was impossible to clear the debris, often difficult when, for example, coins in a soldier's pocket were fragmented by the missile and driven deep into the wound, then it was recognised amputation through sound tissues above the wound was a means of preventing serious complications and the patient's death. This important realisation changed the management of gunshot wounds dramatically and proved a significant surgical breakthrough, ushering in elective amputation as an increasingly acceptable procedure, even in the days before anaesthesia and asepsis. However, for most surgeons a major limb amputation posed a number of difficult dilemmas:

- i. What were the precise factors determining which injured patients required amputation and which could be treated expectantly?
- ii. When was the best time to undertake amputation?

- iii. At what level should amputation take place?
- iv. What assistance, equipment and instrumentation were appropriate?
- v. How was the patient's pain to be managed?
- vi. How was the inevitable bleeding to be controlled?
- vii. How was the stump to be dressed and infection avoided?

And later, if the patient survived:

- viii. Would the stump be suitable for an artificial limb and what was available?

Many of these issues are discussed in earlier or later chapters and do not receive further attention here. However, questions i, ii and iii merit consideration now as they are influenced, in part at least, by the patient in preliminary discussions with their surgeon.

As the quotation from Fergusson at the head of this chapter suggests, surgeons faced with an injured patient were often perplexed in determining the best course of action, summed up by Gross, as already noted, in observing it was possible to mutilate a limb that might have been saved and endanger life by retaining one which should have been amputated. On battlefields and battle-ships, these issues appeared to have been more clearly defined and amputation performed more readily because of the press of numbers and difficulties in evacuating men with agonising wounds due to inefficient splintage and lack of transport. Further, men under military discipline and exposed to peer pressure were more likely to acquiesce to surgical advice, particularly if virtually immobilised by pain and shock and knowing an arm amputee could walk on his own or with a comrade, and a leg amputee might manage crutches or be evacuated on horseback. This experience of military conditions influenced civil practice, especially after warring periods ceased and military surgeons returned home in large numbers. Certainly there was a period in the 17th and early 18th centuries when practically all civilian compound fractures were subjected to amputation, even when not associated with the foreign bodies of gunshot wounds. However, as already emphasised, Bilguer, John Hunter and others with military experience began to question such management, and indeed Bilguer claimed amputation

was rarely indicated.³⁴ This movement encouraged more-conservative treatment, the practice of delayed amputation and, in civil practice particularly, a growing interest in seeking less destructive operations especially for joint disease and limb aneurysms (see Chapter 7).

During the Napoleonic campaigns, there was reversion to immediate amputation, whenever possible, on the part of military surgeons such as Larrey, Percy, Guthrie and Hennen, doubtless related to encounter with vast numbers of wounded, difficulties in their evacuation and a lack of sufficient hospital facilities. Where evacuation to a hospital took place, a waiting policy was possible yet fraught with uncertainty, as in the case of Corporal Wheeler shot at the Battle of the Nivelle in 1813. He received penetrating bullet wounds close to both ankles and was conveyed by mule and also by a cart to St. Jean de Luz for hospital treatment. The left leg settled but the right continued to discharge and he was evacuated by boat to convalesce at St. Andia near Spain where unhappily, some 6 months after injury, the wound deteriorated and formed an abscess which was opened; he was sent to the incurable ward at Funterrabia. He wrote:

"My wound continued to get worse, I had every attendance that could possibly be given and all the remedies applied to prevent mortification, at length my leg and thigh was reduced so small that I could span it with my hand, but the wounded part and foot were swollen to an enormous size, and the wound was as large over as a tea saucer. It was at length agreed to amputate my leg, this I joyfully agreed to being heartily tired of such a frightful troublesome member. Twice were I removed to the surgery to undergo the operation but each time the little Spanish Doctor, who had charge of me, overruled it and I was taken back to my bed, I understood my Doctor wished to try something else, then if that failed the leg was to come off."

Eventually, the doctor applied "something like pepper and salt mixed" from a bottle and the wound was bound up for several days.

*"My wound now was changed from a nasty sickly white-brown colour to a bright red (sic). He (the doctor) capered about like a mad fellow, called the other doctors who all seemed surprised, he put some more stuff out of the bottle on the spots and the next morning I was removed down stairs This was on the 9th inst. (9th June, 1814). Since then my wound improves surprisingly."*³⁵

Twelve months later, as Sergeant Wheeler, he fought at the Battle of Waterloo. It was subsequent to the chaos of Waterloo that more-conservative measures were forced on surgeons, simply because thousands of casualties could not be treated for many days; among survivors evacuated from the field, delayed amputations were performed although the results, for example, Charles Bell's patients, proved poor.³⁶

Until general anaesthesia was established, all the surgeon could offer the patient was a speedy operation dependant on his anatomical knowledge. Small advantages were gained after 1718 with the efficient screw tourniquet of Petit, which encouraged accurate haemorrhage control by ligature, as opposed to uncertain cautery, and later in the century with the use of fine crucible-steel knives permitting the formation of rapidly shaped soft tissue flaps. Acceptance of new concepts including anaesthesia was sometimes obtuse as the deplorable remarks of Sir John Hall, Principal Medical Officer in the Crimean War indicate, despite the availability of ether and chloroform which he considered dangerous:

*"However barbarous it may appear, the smart of the knife is a powerful stimulus, and it is much better to hear a man howl lustily, than to see him sink silently into his grave."*³⁷

With the introduction of antiseptic wound practice, the problems of operative pain, haemorrhage and infection were virtually solved, except that many surgeons clung to old ways and refused to accept chemical sterilisation with antiseptics, or practised a partial regimen incorporating some elements, or failed to follow Lister's exacting instructions. As Watson's quotation in Chapter 1 reveals, conservative surgeons rejected Lister's prophylactic system in their ignorance, by thanking God they had neither witnessed its application nor employed it.³⁸ If society was regulated by traditional concepts, then many surgeons were in a similar boat, unwilling to change direction, despite exposure to scientific reasoning. However, the addition of thermal sterilisation in the late 1880s, combined with clear demonstrations of specific pathogenic bacteria in wounds, quickly

broke down remaining resistance to scientific prophylaxis, which continues as the basis of surgical practice in 2005.

Anaesthesia liberated patients from painful experienced during wound exploration by providing time for surgeons to remove foreign bodies and debride damaged tissues thoroughly and, hence, diminishing the need to amputate precipitately. At the same time longer alternative procedures were encouraged to avoid amputation as a solution, especially the reconstruction of damaged arteries. Unhappily, the American Civil War, and the two Great Wars, amongst many other conflicts, have been associated with ever more destructive weaponry (see Chapter 8) and amputation remains a necessary option. In 20th-century civil life, an aging population has added an increasing burden of deficient vascular problems which, too, may require amputation as a life-saving measure. Since World War I and especially World War II, surgeons have worked more closely in cooperation with limb fitters and manufacturers, after recognising their former levels of amputation might not be appropriate to the prostheses available. In major British institutions operative surgeons, specialist limb-fitting surgeons, craftsmen and manufacturers cooperate to the mutual benefit of the amputee who, ideally, receives the most efficient prosthesis for their amputation. In recent years, this teamwork has been extended to harness the expertise of muscle and nerve physiologists, materials scientists and electronic engineers to provide remarkably efficient limbs which often mask a patient's disability entirely.

If these advances have made the surgeon's work easier, there is still the often-difficult task of knowing when to amputate and where to amputate, factors which depend on experience. It is now possible to reimplant limbs if the detached portion is not too traumatised, although such surgery requires time for bones to heal and even longer for nerves to recover, partially at best, after many months or even years. It may be prudent to consider an efficient amputation and prosthesis with a quick return to activity than embark on a prolonged and uncertain period of reconstruction. As a sceptical surgeon entitled a lecture in 1994, "Limb salvage versus amputation: technique over reason?"³⁹

Summary

It is postulated that mankind's acceptance of amputees is necessary before elective surgical amputations are undertaken. Even so, some societies do not countenance elective surgery, usually for religious reasons, despite the presence of amputees of congenital, traumatic and punitive or legal origin sanctioned by the same societies. Hence, the wish of a patient to live with three limbs than to die with four, even with the acquiescence of a surgeon, carries no weight unless supported by their communities.

Before anaesthesia, painful amputation was often endured stoically, paradoxically bolstered by intense religious conviction. For the surgeon, the former dilemmas concerning if, when and where to amputate, and how to alleviate pain, prevent haemorrhage and infection, have diminished by utilising modern supportive measures. Limb reimplantation is now possible, although not always successful.

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