
The Mobile Automatic Metabolic Analyzer consists of a mass spectrometer, inspiratory and expiratory spirometers, and an electronic recorder, mounted on a powered cart. Continuous analysis of expired air was performed with 25 unimpaired subjects, 6 unilateral below-knee amputees, 6 unilateral above-knee amputees, and 4 bilateral above-knee amputees, all of whom walked at their comfortable speed on a level surface. Amputees demonstrated increased energy expenditure even at slow walking rates. Below-knee amputees had the least increase and the least speed reduction, followed by unilateral above-knee amputees. Oxygen consumption per kilogram of body weight was plotted against walking speed.

Aggregate results were comparable to those of other investigators. Individual perception of effort seemed related to the level of work, best expressed as a fraction of maximal aerobic capacity. Subjects walking at half of maximal capacity are considered to perform heavy labor, which cannot be sustained for long. Work capacity of normal and impaired subjects can be increased by training. The degree of physical independence following hospital discharge is influenced by the patient's disability, strength, and endurance. Bilateral above-knee amputees expend nearly three times more energy than unimpaired individuals.


Ankle-foot orthoses are worn by those who can walk unassisted, but who are not safe when doing so. The orthosis insures mediolateral stability and prevents toe drag. Shoe firmness and sometimes a T-strap provide frontal stability. The posterior stop prevents plantar flexion and causes the foot to rock over the heel to foot-flat. Since the ground reaction is posterior to the heel and knee, the knee bending moment causes instability unless the patient has muscular control. An ankle stopped at 5 deg. plantar flexion creates a brief small knee-bending moment. One set at 5 deg. dorsiflexion increases the magnitude and duration of knee-bending force.

An anterior stop causes the shoe to pivot over the metatarsal heads. The ground reaction is anterior to the knee. With the ankle fixed at 5 deg. plantar flexion, knee extension lasts most of stance phase. At 5 deg. dorsiflexion a prolonged knee flexion moment is followed by a brief extension moment. A spring in the posterior channel of the posterior stop will raise the toe if the foot is flaccid. During heel strike this spring compresses, minimizing knee bending. A spastic patient requires a rigid posterior stop to prevent toe drag; the shoe heel should be cut or made resilient to reduce knee bending by moving the contact point forward, relocating the ground reaction closer to the knee center.

One can estimate toe pickup and knee bending moment by pushing the orthosis into plantar flexion. One may estimate knee extension moment by assessing how strongly the orthosis resists dorsiflexion. The biomechanical functions of the laminated and polypropylene solid ankle, Teufel, Engen corrugated polypropylene, VAPC shoe clasp, and spiral orthoses are described. With either a standard double upright or a plastic laminated orthosis, the hemiplegic walks faster and uses less oxygen that when unassisted. The biomechanical functions are the same. Checkout applications are summarized.


Eight commercially available control systems were evaluated on 52 quadriplegics at one center. Testing was done in occupational therapy, bedside in the hospital, and home.
The Fidelity Comfort and Communication System was preferred initially because of its simple mode of operation and small display and control box. It was ultimately rejected because of extensive malfunction. The Possum Selector Unit was easy to operate with good visual and audible feedback, but was not preferred due to its bulk and error-prone telephone dialing mode. Also expensive was Nu-Life which had an attractive appearance, small digital display, expansion possibilities, and no repairs, but was rejected because of slow operation, bulk, and lack of flexibility of change of appliances. Remote Operation by Oral Triggering was not liked by anyone because of inaccurate mode of operation, but had no breakdown. The Genie was easy to operate, but not preferred due to annoyance at constantly scanning display, packaging problems, and lack of audio feedback. The costly Touch Operated Selector Control permitted easy nonvisual operation and had no repairs, but was not liked due to lack of visual display. The most acceptable units were the Prentke-Romich Environmental Control Unit-1 and the Automatic Dialing Telephone; the rocker-lever pressure switch was most popular.

All typewriters needed repair, were more expensive and less convenient than mouth-stick or balanced forearm orthosis typing. The PMV Printer was rejected by all due to operating mode and display and fragility. The Possum Scanner was too slow. The Possum Hi-Speed was useful to those for whom mouth-stick activities were contraindicated. Operation of the PMV Minimum with a mouth stylus was easy.

Training for all devices required only a single explanation. All could use all types of pneumatic interfaces which were needed by C-2-4 level patients; C-4-5 patients often used a combination of pneumatic and pressure controls.

An Evaluation of the C.A.R.S.-U.B.C. Knee Orthosis. Brian Reed

The University of British Columbia knee orthosis was evaluated on ten women having moderate or severe rheumatoid or osteo arthritis and mediolateral knee instability. The orthosis was designed to stabilize knee varus or valgus. Two plastic cuffs encircling the thigh and shank are connected by a telescoping rod. When the knee is extended the system becomes taut and provides maximum support. When the knee is flexed there is complete freedom. For medial relief, the cuffs and rod are fitted to the lateral side of the leg and a leather pad supports the medial side.

Severity of involvement was assessed by tabulations based on range
of motion, joint stability, and functional capabilities. Subjects were
tested upon delivery of the orthosis and 2 to 4 weeks later. They
climbed stairs and a ramp and walked on level surfaces. Data from
adjustable force sensors strapped to each shoe, two knee elec-
trongoniometers, a tachometer, and force plates were collected electron-
ically. Parameters measured directly or derived from the data were:
peak-to-peak range of knee motion, vertical load, rate of loading,
swing/stance ratio, task time, velocity, and symmetry of range of mo-
tion, loading rate, and step length. Static alignment photographs were
taken to superimpose the floor-reaction force vector on an image of the
patient’s limb. Subjects also completed questionnaires.

There was a small average improvement with the orthosis. Most
subjects had measurable change in weightline location. Most thought
the orthosis helpful.

**Computer Generation of Human Gait Kinematics.** M. Y. Zarrugh
(Department of Mechanical Engineering, University of Michigan,
Ann Arbor) and C. W. Radcliffe (Department of Mechanical En-
gineering, University of California (Berkeley), Journal of

This paper describes a computer program that generates absolute
motion variables from predetermined relative motions. Relative dis-
placements were measured over a range of walking speeds. Six vari-
able identifiers need to be specified to compute any desired variable.
Photography provided the best measurement of absolute gait vari-
ables, whether by the interrupted light method, cinematography, or
optoelectronic recording with television recording and photodetector
plates. String transducers measure absolute displacement, velocity,
and acceleration. Body rotations are measured by goniometry on the
segment or pin studies into the bone.

The walking mechanism was analyzed in terms of seven articulated
segments, right and left lower limb, each divided into thigh, shank, and
foot-shoe, linked by the head-arms-trunk. The model has 12 links, six
in the lower limbs, and the others in the pelvic girdle, thorax and head,
right arm, right forearm, left arm, and left forearm. Symmetry is
assumed. Kinematic analyses can be applied to the entire system of
twelve links with a program written in FORTRAN IV that computes
absolute motions of these links from internally stored harmonic coeffi-
cients. Braune and Fischer’s anthropometric data remain most useful.

The data showed abrupt change in lower-limb flexion patterns at
about 105 steps per minute. Below this rate, flexion patterns showed
almost no effect due to increased step rate. The knee remained almost
fully extended during most of stance. Increased step rates resulted in increased knee flexion during stance, earlier toe-off points, and increased hip flexion. Changing step length indicates how the basic gait parameters change. Step length has the largest influence on pelvic displacements; rotation about a vertical axis increases with increased step length.

There is an extensive bibliography.

**Evaluation of Ultralight BK Prosthesis.** Brian Reed, A Bennett Wilson, Jr., and Charles Pritham (Moss Rehabilitation Hospital, Philadelphia, Pennsylvania), Orthotics and Prosthetics 33:45-53, June 1979.

Seven prosthetic firms participated in a study of 36 patients fitted with the polypropylene prosthesis. All patients were provided with the design using a rigid toe section for maximum lightness. Prosthetists attended a 12-hour course. Evaluation was based on questionnaires administered to patients and prosthetists. Four patients received the ultralight prosthesis as their first definitive limb. Most patients reported that walking required less energy and that the light prosthesis is easier to control and more comfortable. Most said the conventional prosthesis was more cosmetic. There was no significant difference in ease of donning. Most subjects preferred the ultralight prosthesis.

Three fractures of the plastic at the toe area and two crushes of the internal keel foot were corrected by using an external keel foot which added 8 ounces to the prosthesis. One subluxation of the socket within the shank was solved by using heavier polypropylene. Half the subjects disliked the rigid foot, for heel strike was jarring and it was difficult to ascend inclines. Some said the lightness reduced pistoning. Prosthetists complained that the prosthesis is difficult to modify and had structural failures, especially at the foot.

A new fabrication manual will be published.


Analysis of the first step of the walking cycle was accomplished with 10 normal adults. Photographs from the front, each side, and below enabled investigators to measure pelvic tilt, hip flexion-extension, knee flexion-extension, ankle dorsiflexion-planter flexion, sagittal body displacement, pelvic obliquity, and tibial rotation. Force plates recorded vertical force, fore and aft shear, medial and lateral shear,
torque, and the center of pressure. Electromyographs of nine lower limb and trunk muscles were obtained.

The cycle was divided into initiation of right swing until toe-off; right toe-off to heel-strike; right heel-strike to left toe-off (double support); and left toe-off to heel strike.

Initially, the center of pressure moved backward toward the right; both tibialis anterior and quadriceps groups and the right gluteus medius contracted. Soon the right peronei and left hip abductors were active. The center of pressure was at its maximum rightward point at 20 per cent of the cycle, when the right hip and knee flexed and the ankle dorsiflexed. During this period, the only left movement was ankle dorsiflexion.

After the right foot left the ground, the center of pressure moved forward; left anterior tibialis and quadriceps controlled this movement until the center passed in front of the left knee. Vertical force increased just prior to left heel strike, coincident with the fall of the center of gravity. When the right heel struck and the body leaned forward over the left limb, peak posterior shear force occurred. During double support, speed increased, and vertical, fore-and-aft, and medial and lateral shear forces reached zero. Velocity was one-third of normal during the first step; by the second step, pelvic travel and joint speed were equal to those recorded in steady walking, and from the third step, walking speed and rates of joint motion were maximum.


The prosthesis extends the amputated leg and serves as a component in locomotion. It must accept the considerable forces involved in standing and walking and respond to the amputee’s needs. Soft tissues displaced by external forces decrease stability and rigidity of prosthetic fixation, causing loss of energy, discomfort, and gait distortion. Stability of force transmission depends on using soft tissues to reduce relative movements between femur and socket. The prognosis is better with myoplasty or osteoplasty. Suspension also affects stability; total contact suction is most efficient.

Mediolateral pelvic instability results from lack of fixation. The femur, without skeletal connection to the foot, tends to move laterally. If the socket does not contact the ischium it also tends to move vertically. Without fixation, the hip cannot serve as origin and support for pelvic stabilization during prosthetic stance. Connecting the socket to
the ischium allows the amputee to use hip muscles to balance the pelvis. When stabilizing the pelvis, abductors tend to rotate the femur in the socket. Reaction forces occur in the laterodistal and medioproximal portions of the stump. If tissues there cannot accept pressure, pelvic stability reduces. Amputees with short stumps tend to tilt toward the amputated side to reduce surface pressure. Proper socket configuration is important. No knee or foot mechanism can correct for an improper socket.

If socket volume is smaller than stump volume, edema, fatigue, impaired sensibility, and tissue damage result. With too narrow a socket, it is difficult to provide ischial contact. Suction requires sealing by stretching the skin when the stump is moved into the socket. Pressure between skin and socket must be sufficient so friction and sealing are established. Flexibility of soft tissues affects socket circumference. Casting involves use of an elastic bag to control volume and manually shaping the quadrilateral contour.


Five causes of damage to insensitive tissue were identified. As little as 3 pounds per square inch applied continuously can cause a pressure ulcer in several hours. The insensitive individual, such as a diabetic, does not have enough sensation to cause him to shift from the source of pressure. A tight shoe will cause ulcers by exerting undue pressure. Since the shoe curves sharply around the medial and lateral borders, pressure is highest at these points and tissues ulcerate there. Patients are told never to wear new shoes for more than two hours, and to change shoes at midday and evening to reduce the time pressure might be exerted.

The second cause of damage is force applied over too small an area. Patients are warned not to walk barefoot and to shake the shoe before donning to prevent stepping on small objects. Excessive heat or cold also damages; carpets shield the foot. Repetitive moderate pressure is also injurious. After walking several miles the normal individual will alter his stride or rest. The patient with insensitivity will not. Repeated stress inflames tissue, then causes necrosis. Inflammation brings lysosomal enzymes to the area. There is autolysis of tissues deep at the center of the stressed area. In several days the focal necrosis surfaces. Soft insoles and other shoe modifications lower pressure. The patient must lower the number of repetitions by walking shorter distances, and must inspect his foot.
The fifth cause of damage is pressure on infected tissue which spreads infection into bones and joints. The diseased part needs absolute rest with a splint until it heals. Foot ulcers require complete bed rest for a few days, followed by a molded plaster walking cast.

**Normal Human Locomotion.** J. Hughes and N. Jacobs (National Centre for Training and Education in Prosthetics and Orthotics, Glasgow, Scotland), Prosthetics and Orthotics International 3:4-12, April 1979.

A gait cycle starts the instant one foot contacts the ground, and ends when that foot again contacts. Stance phase, when the foot is in ground contact, is 60 per cent of the cycle at normal speed, reducing as speed increases. Double support occurs when both feet contact the ground at the same time. Muscle forces are often much larger than externally applied forces because lines of action of muscles are frequently close to the joint centers. Pathological gait arises from the inability to exert or control muscle forces or the resulting joint forces. The most relevant external forces are due to force between the foot and the ground.

Stick diagrams identify the situation at significant points in the cycle. Sagittal analysis includes ground reaction at the hip, knee, and ankle positions and muscle actions. At heel strike the reaction is anterior to the hip and knee and behind the ankle. Shortly after heel strike and at foot flat, the reaction is anterior to the hip and behind the knee and ankle. At midstance the reaction is through the hip, behind the knee, and in front of the ankle. At heel off the reaction is posterior to the hip and anterior to the knee and ankle. By toe off the reaction is minimal since most weight is borne by the other foot. Acceleration, mid swing, and deceleration have no ground reaction.

The moment action at prosthetic joints determines the resisting moment which must be applied there. Shortly after heel strike, the plantar flexion moment should be resisted by the plantar flexion bumper. The moment action at a knee without stance stability mechanism would lead to collapse of the amputee unless force actions tended to extend the knee, as by placing the knee center behind the line of action of the external force.

Serratus anterior palsy limits active shoulder flexion and abduction, and produces much discomfort in the scapular area during arm movement. Most commonly the long thoracic nerve is injured. Complete recovery may take many months. Three main braces are the bilateral scapular with over-the-shoulder bands, bilateral scapular with under-the-shoulder bands, and the unilateral. The most disabling dysfunction is lack of adequate scapular fixation during active flexion and abduction. Winging of the medial border of the scapula increases as the arm is elevated. Displacement of the inferior angle is more severe during flexion because the upper limb imposes a great torque. The range of flexion is usually less than 90 degs. At rest the scapula displaces medially. Active scapular rotation is lacking. Orthotic prevention of winging is difficult because large forces are required. Flexion creates a lever system with the axis at the acromio-clavicular joint. One lever arm is the distance between the axis and the center of gravity of the arm. The other lever arm is the scapular height, the vertical distance between the axis and the inferior angle. A brace must be firmly anchored to the thorax with bilateral scapular plates. Medial scapular displacement should be prevented by a block against the medial border of the scapula, but the thinness of the medial border and the mobility of the overlying skin prevent blockage. Static braces cannot correct deficient scapular rotation. Thus the patient has difficulty in the extreme flexion range, but lower flexion is easier once winging is controlled. The under-the-shoulder bilateral scapular brace allows much freer movement. Two patients fitted with such braces recovered in one year.


Five patients with femoral shaft fracture were treated with skeletal pin traction for 10 to 18 days following injury. Then each had a plaster cast-brace applied while traction was maintained. The hip was abducted approximately 20 deg. Polycentric knee hinges and a hip hinge were used. Four small rubber bags were inserted between the layers of stockinette over the thigh. Pressure recordings were taken with the bags when the patient was lying relaxed, lying and contracting the quadriceps, standing symmetrically, standing primarily on the fractured limb, standing solely on the normal limb, and standing primarily on the fractured limb while contracting the quadriceps.
Weekly radiographs demonstrated the average shortening was 0.38 cm. After healing, three patients had cast-braces with pressure bags applied to the contralateral limb, to provide control readings.

The lowest pressures recorded were when the patient was resting. In most cases, pressures were highest when patients bore weight on the fractured limb while contracting the quadriceps. Pressure over the proximal thigh increased until healing was advanced. Significant decreases occurred when hip hinges were removed.

The conically shaped thigh cast exerted nearly uniform low pressure when the patient was resting, and pressure two to four times greater when thigh muscles contract as in standing. These high pressures applied to soft tissues were effective in limiting shortening. The fracture should be held at least to length, preferably distracted, until the cast-brace is applied. The hip hinge prevented gaps between skin and brace, and facilitated fracture alignment and plaster application.


A literature review demonstrated that much stress was laid on providing transport to the “transport disadvantaged”; that is, the very young, the elderly, handicapped, poor, and carless parents of young children. Decline in public transport service decreases the mobility of handicapped persons. Many countries have similar legislation to make public transport accessible. Savings accrue by enabling the handicapped and their attendants to become tax paying workers. The social rationale for transportation is based on equal rights.

Disabled persons may be dichotomised as those who are housebound and those who travel regularly, often with great difficulty. Low overall travel demand results from difficulties in obtaining access to and using public vehicles and changes in lifestyle resulting from the handicap. Most effort has been devoted to designing transportation for easier use.

Since most of the handicapped are also elderly, improvements in walking; conventional, specialized, and personal transport; taxis; buses; and privately owned systems aid both groups. Walking is the prime method of access to most other systems. Thus adequate footways are needed. Removal of steps, gaps, and other barriers will enable more to use public trams, rails, and buses. The problem of retrofitting existing rolling stock and modifying pavements, and installing ramps and lifts is large. Specialized transport providing door-to-door service is very expensive. Taxis are largely unused because of
high cost, although fares can be reduced for the disadvantaged. Car ownership among the handicapped population is increasing. A mobility allowance allows the individual to purchase and run his suitably modified car. Private systems for the handicapped are very expensive.

There is an extensive bibliography.


Fifteen quadriplegics were evaluated in the near resting state without and with a corset from pubis to xiphoid, designed to provide tight abdominal support. A window accommodated ileal bladder openings. Each underwent eleven respiratory tests, including vital capacity, inspiratory capacity, expiratory reserve volume, forced expiratory volume, maximum breathing capacity, peak expiratory flow rate, and end tidal expired carbon dioxide and oxygen. Tests were performed with a noninvasive breath analyser. Each patient was studied sitting and supine. Values were compared with those predicted from anthropometric data.

After spinal shock subsides, the time since onset of injury has little bearing on most respiratory functions. In the supine position, there was significant improvement in vital capacity, inspiratory capacity, and tidal volume, especially with the corset removed. The position effect of sitting was more important in affecting respiration than whether the patient wore a corset.

Quadriplegics work more to breathe and to maintain near normal alveolar ventilation. This, rather than muscular weakness, explains why they have shortness of breath wheeling up inclines. Increased work may be due to their decreased compliance, the volume change produced by a unit of pressure, because of loss of rib cage elasticity, rather than lung change. The work of breathing is related to the diaphragmatic component working against the viscera and the depth of tidal volume. A corset has no untoward effect on respiration. Although no significant corset effect is confirmed in sitting, most parameters improved when wearing the corset.


Historical prostheses had a thigh corset and knee joints. Today, the
corset is used primarily to increase the amputated limb's stress resistance. Many believe when a corset is used the socket should be loosened to allow motion between prosthesis and the residual limb.

The antecedent of the PTB cuff is the soft strap used with the "Muley" prosthesis. Several modifications of the design and materials of the PTB cuff exist. The most frequent addition is a waist belt. Belts are unaesthetic, uncomfortable, easily soiled, and fragile, but may augment a thigh corset. A belt used with a cuff on a temporary prosthesis accommodates limb changes. The belt with cuff on a definitive prosthesis suits patients too confused to fasten a cuff properly. Suspenders are rare, although a harness for infants insures prosthetic retention.

The Blevens socket has a posterior rubber pad. Muscular grasp suspension, whereby straps and brim extensions are eliminated, still receives attention. Suction has not been very successful because of the boniness of the below-knee limb. Rubber sleeve suspension with or without a gel liner is simple, but may be constricting, hot, and fragile.

All brim suspensions deal with the problem of passing wide femoral condyles through a narrow inlet above the adductor tubercle. Extending the trimline increases surface area and stabilizes the knee. There is no agreement on prescription or fabrication procedures. The first brim modification was the supracondylar-suprapatellar with or without a liner. The basic or modified removable medial wedge is generally used with a hard socket. The compressible medial wedge is glued to the socket, speeding donning. The removable medial brim suits patients having a large difference between condylar and supracondylar mediolateral diameters. Hardware for the inflatable medial wedge which allowed the patient to adjust suspension pressure is no longer available.

The article includes an extensive bibliography.


Custom-made masks prevent hypertrophic scarring after deep burns. Masks apply pressure which modifies healing until the elasticity of surrounding tissue is exhausted. Pressure should be applied 20 hours daily until the scar is mature, soft, supple, and light pink.

A negative alginate impression of the face is reinforced with plaster. A plaster positive mold is made, with the surface smoothed to remove hypertrophic scar details. Cellulose acetate butyrate sheeting
is heated and pulled over the mold. Modifications are done after spot heating. Pressure must be total contact. Excessive pressure before the scar has softened can cause ischemic necrosis. Four to six reheatings are possible before the plastic fails. Revisions for total contact are initially done weekly.

During the day, the mask is worn alone. At night, an elastic hood is worn under the mask. The hood maintains constant pressure, while the mask shapes the face. Controlling the forehead with a hood and the nose, cheeks, and chin with the mask allows more jaw freedom and less shearing on the skin when the patient talks.

The mast is never off for more than one hour. The patient may require a mouth stretching device to counteract microstomia.

**Therapeutic Footwear for the Insensitve Foot.** George H. Hampton (Department of Physical Therapy, Louisiana State University Medical Center, New Orleans), Physical Therapy 59:23-29, January 1979.

Corrective force to realign the skeleton may injure soft tissue. Deformity must be accommodated. An insole of microcellular rubber glued to closed cell polyethylene foam reduces plantar compression and shear and relieves bony prominences. A metatarsal bar transfers stress from the metatarsal heads to the shafts. The shoe sole should bend distal to the bar. A rigid rocker sole also diminishes forefoot stress. The insole and shoe upper should be molded on a plaster model of the nonedematous foot, and the rocker axis should be near the foot center. The bar should be thick enough to prevent contact between the toe of the shoe and the floor at the toe-off phase of walking. The patient should reduce stride length and begin knee flexion early. He can protect his feet by noting stride length and the duration and frequency of level and ramp walking, squatting, and kneeling.

Methods of evaluating shoes include use of thermometry, the Harris mat footprint, pressure transducers, pressure-sensitive microcapsules, and visualization. Microcapsule impregnated polyurethane socks show compressive and shear stress. Microcapsule breakage could not be correlated with pressure transducer data because the transducers did not measure horizontal or rotary forces. Stress patterns in footwear should be examined before and after shoe modifications.

Footwear for the foot without deformity can be regular, perhaps with a rubber insole. The snugness of the shoe must be checked. Insensitive feet with plantar scarring require shoes with a poly-
ethylene foam and microcellular rubber insole, and sometimes a metatarsal bar. Feet with bony deformities need a molded soft insole in an extra depth shoe to prevent plantar ulcers. The most severely damaged foot has shortening because of bone absorption or amputation, and needs custom-made sandals, extra depth shoes, or custom-made shoes with a rigid rocker sole. The aggressive footwear program has reduced injuries significantly.

**Wound Healing in Below-Knee Amputations in Relation to Skin Perfusion Pressure.** P. Holstein, P. Sager, and N. A. Lassen (Department of Clinical Physiology and Surgical Department M, Bispebjerg Hospital, Copenhagen, Denmark), Acta Orthopaedica Scandinavica, 50:49-58, February 1979.

A prospective study of 65 patients, half with diabetes, involved preoperative and postoperative measurements of local skin perfusion by the isotope washout method. Washout cessation pressure was determined as the highest external pressure which allowed a minimal washout to be discerned, plus 3 mmHg. Pressures were measured on both legs. Four to eight weeks after below-knee amputation, pressures were again taken.

Most patients had conventional surgery with anterior and posterior flaps. Wounds were loosely dressed. Six patients died before healing could be established. One-fourth of those with preoperative pressure below 20 mmHg healed, and none walked; the others had skin necrosis. Two-thirds of those with pressures between 20 and 30 mmHg healed. Ninety percent of those with pressures above 30 mmHg healed—those who did not have infection. In the non-diabetic cases, differences in healing rates correlated significantly with the level of pressure. In diabetics, no correlation was found. Pressures averaged 33.7 mmHg in the non-diabetic and 56.7 in diabetics. The level of most distally palpable pulsation correlated significantly with healing and with perfusion pressure. The absence of femoral pulsation did not rule out healing at the below-knee level.

Skin perfusion pressure on stumps was an average 8 mmHg higher than preoperatively; there was no change on the contralateral limb. Most patients returned home; half could walk with a prosthesis. Flow values of above 0.6-2.6 ml/min/100 g tissue indicated high success. Diabetics are often better amputation candidates because their arterial supply is better and amputation is necessitated by distant foot lesions.