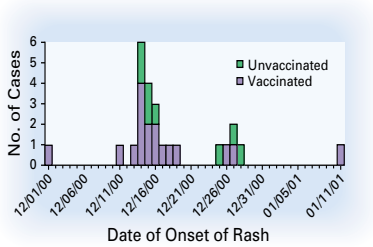
This Week in the Journal

December 12, 2002

An Outbreak of Varicella among Vaccinated Children

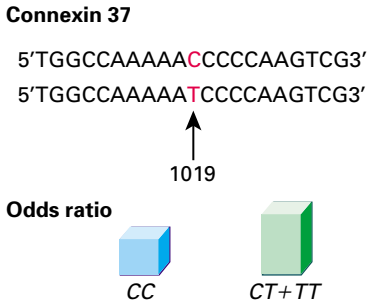


At a day-care center in New Hampshire, an outbreak of varicella affected 25 healthy young children, including 17 who had been vaccinated against varicella. The index patient was a four-year-old who had been vaccinated three years earlier. In this outbreak, the effectiveness of previous varicella vaccination was only 44 percent against disease of any severity, but it was 86 percent against moderate or severe disease.

This outbreak in a population with good vaccination coverage shows that varicella can be highly infectious among vaccinated, healthy children. The effectiveness of the vaccine was well below the estimates of 71 to 100 percent from earlier investigations.

see page 1909 (editorial, page 1962)

Risk of Myocardial Infarction and Polymorphisms in Candidate Genes



The risk of myocardial infarction is known to be influenced by genetic factors, but few such factors have been identified. This study found that a polymorphism in the connexin 37 gene in men and polymorphisms in the plasminogen-activator inhibitor type 1 gene and the stromelysin-1 gene in women were associated with an increased risk of myocardial infarction.

On the basis of their cellular functions, mutations in each of these proteins could be anticipated to affect the risk of myocardial infarction. The delineation of such genetic risk factors may lead to an improvement in primary-prevention efforts.

see page 1916 (editorial, page 1963)

Reconstruction versus Amputation after Leg-Threatening Injuries

"Reconstruction typically results in two-year outcomes equivalent to those of amputation."

This observational study compared two-year outcomes of patients with severe leg injuries who underwent reconstruction or amputation. The health status (as measured by a multidimensional instrument) of patients who had undergone reconstruction was similar to that of patients who had undergone amputation.

Although the nonrandomized design of this study leaves open the possibility of residual confounding, the results suggest that the health and other functional outcomes of patients who have undergone limb reconstruction are likely to be similar to those of patients who have undergone amputation.

see page 1924 (Perspective, page 1906)

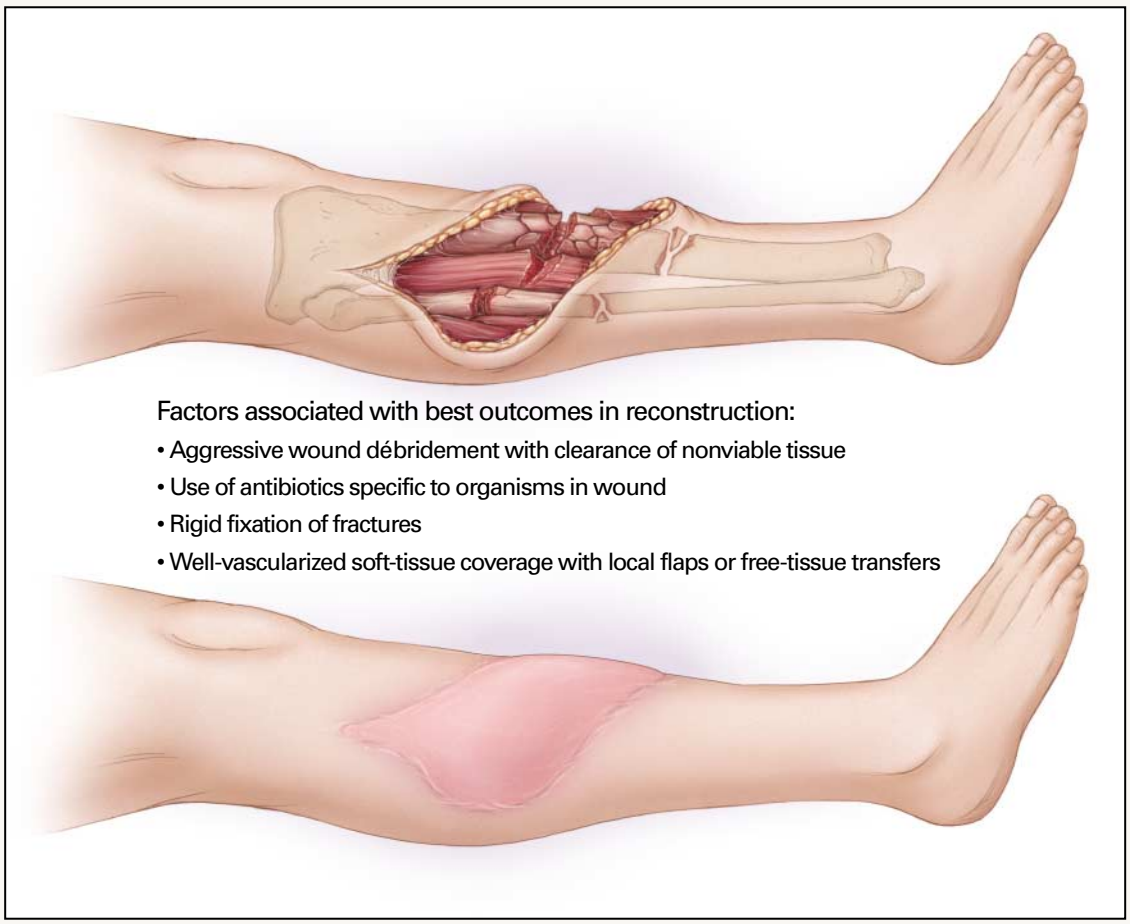
PERSPECTIVE

To Reconstruct or Not to Reconstruct?

In the opening scene of the movie "Dances with Wolves," dazed Union Army soldiers with mangled limbs are laid out, resigned to their turn at the surgeon's cleaver. This scene is typical of health care in the mid-19th century, when severe leg trauma would more often than not result in early amputation. Now, 150 years later, the debate continues over whether complex limb salvage or early amputation followed by fitting of a prosthesis is most likely to allow return to a normal lifestyle.

Progress in leg reconstruction has been marked by clearly defined steppingstones interspersed with decades of stagnation in practices. Principal milestones have included the immobilization of the fractured leg with a plaster cast; aggressive débridement of open wounds with removal of all nonviable tissue; the use of antibiotics tailored to organisms cultured from the wounds; rigid fixation of fractures with external-frame devices (fixators) or internal rods and plates; well-vascularized transplantation of soft tissue, including muscle, for early wound coverage; bone grafting; and aggressive physical therapy (see Figure).

These methods of treatment alone, however, cannot ensure a better outcome from reconstruction than amputation. Ultimate success also depends on appropriate selection of patients, the patient's compliance with an arduous rehabilitation program, and the experience and skill of the treating health care team. The patient's age, general health status, coexisting conditions, and accompanying injuries must be



Key Treatment Principles for the Care of Leg Trauma.
In addition to the factors listed in the figure, treatment should include a careful and thorough history taking and comprehensive physical therapy and rehabilitation.

considered. The patient's occupation and obligations as a financial provider also play a part in decisions about whether to submit patients to long, multistage reconstructive procedures. As has been shown in the treatment of cardiovascular disease, care provided in institutions that specialize in the evaluation and treatment of major leg and arm trauma should maximize the chances for appropriate surgery and comprehensive, integrated rehabilitation.

The severity of a limb injury must be judged in many ways. There are questions regarding the status of the bones. What is the nature of the fracture? Is it simple or comminuted? Is it open or closed? Is it diaphyseal or intraarticular? Is it confined to one level or does it affect multiple sites? Are there breaks above and below the knee? Is there extensive periosteal destruction? The status of soft tissue must also be considered. Is there an open wound accompanying the break? If so, how large is it? Is there avulsion, crush, contusion, or overt tissue death? Another consideration is the neurologic status. Is there sensation present on the plantar surface of the foot, implying intact tibial-nerve function? Finally, what is the vascular status? Is there adequate vascular inflow, as judged by physical examination, noninvasive duplex scanning, or angiography? Only when these questions have been answered thoroughly can a treating surgeon or, better, a collaborative team appropriately recommend a customized rehabilitation plan with some degree of confidence that it will maximize the patient's functional outcome.

Certain injuries are well recognized as poor candidates for reconstruction. The Gustilo classification for open tibia fractures (types I, II, and III, with the last subclassified as A, B, or C, depending on the vascular status and the degree of soft-tissue destruction) has provided practitioners with a uniform set of guidelines to help in making decisions about treatment. Although patients with isolated type IIIA and IIIB injuries generally do well with reconstruction, patients presenting with type IIIC fractures have a much higher incidence of eventual amputation and are oftentimes better off being guided toward early, definitive limb shortening. Similarly, patients with massive crush injuries to the foot and ankle with vascular compromise and loss of sensibility usually require amputation.

During the past 50 years, the most confounding chronic complications of reconstructive surgery have been osteomyelitis and chronic nonunion, often presenting together as an infected nonunion. The introduction of radical débridement and early coverage of the wound with either local muscle flaps or free-tissue transfers from distant locations, including the latissimus dorsi or rectus abdominis muscles of the trunk, has been instrumental in reducing the frequency of these complications. The result has been a decrease in time spent in the hospital, time to healing, the number of infections, and the number of ultimate amputations. Large numbers of patients have benefited from these limb-saving operations with not only anatomical preservation but also restoration of the function of the leg. Most have returned to work and been able to enjoy a nearly normal lifestyle.

As may occur in any rapidly progressing field, however, leg salvage may have reached too far in attempting to repair essentially unreconstructable lower extremities. Aside from rare patients with type IIIC fractures, many patients with severe crush injuries of the foot and ankle, either alone or in combination with open tibial fractures, have ended up with useless, painful legs after many complex operations and prolonged hospital stays. These frustrated attempts at reconstruction have resulted in the creation of a subpopulation with long-term disability, depression, and ultimate treatment failure. Patients presenting with injuries to the posterior tibial nerves accompanying open osseous leg trauma have rarely returned to any acceptable functional status after attempted reconstruction.

In this issue of the *Journal*, Bosse and colleagues (pages 1924–1931) report the results of a prospective, observational study of long-term outcomes after multistage leg salvage or early amputation in patients with severe leg injuries. After adjustment for characteristics of the patients and the injuries, functional outcomes in patients who underwent amputation were essentially the same at two years as those in patients who underwent reconstruction.

Although advances in composite prostheses have resulted in extraordinary improvements in quality-of-life measures among leg amputees, the process of counseling a patient with an acute injury to proceed with elective early amputation continues to be one of the most daunting challenges for the treating physician. The information provided by Bosse and colleagues will help to inform this process. Whichever approach patients and their treatment teams choose, strong support from family members and peers remains crucial to the physical as well as psychological outcomes after these devastating injuries.

RANDOLPH SHERMAN, M.D.
University of Southern California
Los Angeles, CA 90089-9224

"Neither the public nor physicians have the sense of urgency expressed by many national organizations."

Special Article in the Patient Safety Series: **Views of Practicing Physicians and the Public on Medical Errors**

According to this national survey, neither the public nor physicians view medical errors as one of the most important problems of the U.S. health care system. Practicing physicians and the public believe individual health care professionals are responsible for most errors. These findings are in sharp contrast to the Institute of Medicine's report that medical errors are widespread and the result of failures in systems, not individuals. The discrepancy between these views is likely to impede the success of efforts to reduce medical errors.

see page 1933 (editorial, page 1965)

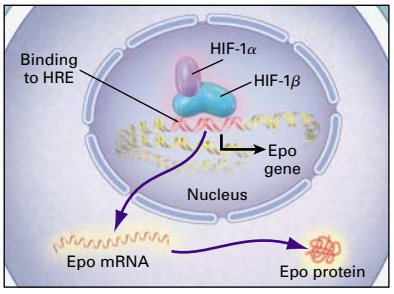
Risk-Factor Modification for Peripheral Arterial Disease

Smoking cessation
Low-density lipoprotein cholesterol <100 mg/dl
Glycosylated hemoglobin <7.0 percent
Blood pressure <130/85 mm Hg
Angiotensin-converting–enzyme inhibition
Antiplatelet therapy Aspirin or clopidogrel

Medical Progress: **Exercise Training for Claudication**

Claudication, a manifestation of systemic atherosclerosis and accompanying peripheral vascular disease, is characterized by pain induced by walking in one or both legs; it primarily affects the calves. Claudication usually does not abate with continued walking and is relieved only by rest. Since the effects of approved medication are usually limited, exercise programs have been developed to treat this painful condition. This review discusses the rationale for an exercise program for the patient with claudication, with a focus on pathophysiology and the effect of training.

see page 1941



Clinical Implications of Basic Research: **Erythropoietin**

Apoptosis causes the death of photoreceptors in macular degeneration and retinitis pigmentosa and the death of retinal ganglion cells in glaucoma. Receptors for erythropoietin are present in both types of cells, and in mice, erythropoietin blocks light-induced apoptosis of these cells. Erythropoietin has potential as a treatment for degenerative retinal diseases.

see page 1968

"Some might believe the health system will continue to adapt to stress. It is far more likely that we will face major discontinuities, or even collapse."

Sounding Board: **Homeostasis without Reserve — The Risk of Health System Collapse**

In this Sounding Board article, the author describes the changes in public policy and in the marketplace that have placed stress on the U.S. health care system over the past decade. The system has showed considerable homeostasis, and its structure has not changed dramatically. The author contends, however, that we have not addressed the underlying problems and that the turbulence of the past 10 years has left our health care system with little reserve and vulnerable to collapse.

see page 1971