

Plastic surgery

PLASTIC SURGERY has seen many changes in the past five years. Advances in our knowledge of genetic coding, growth factors, and tissue engineering offer the potential for new treatment options in the near future.

Prevention. Craniofacial surgery has undergone an explosion of new discoveries over the past five years, which has the potential to lead to dramatic improvements in diagnosis and treatment of craniofacial disorders.

Recent studies have demonstrated that mutations in the genes that code for fibroblastic growth factor receptors (FGF-R) are at least partially responsible for both syndromic and non-syndromic craniosynostoses (Figure).¹ To date, four FGF-R subtypes have been identified. These tyrosine kinase transmembrane proteins function as high-affinity receptors for fibroblast growth factors and have been implicated in the regulation of cellular proliferation, differentiation, chemotaxis and apoptosis.

Clinical applications of these findings are currently limited to genetic testing for some of the common craniosynostosis syndromes, but the hope is that these conditions will one day be treated with a combination of minimally invasive procedures and gene therapy.

In a similar way, the complex cascade that determines upper-limb development is being unravelled. A number of important protein signals have been discovered and their role in upper-limb growth may provide therapeutic options in prevention of upper-limb anomalies.

Diagnosis. Malignant melanoma is one of the most common cancers in Australia, with the estimated risk of developing a melanoma before the age of 75 years in Australia being one in 26 for men and one in 36 for women. Management of melanoma saw dramatic changes through the 1990s, in particular with regard to safe excision margins. However, it remains an intense area of research. Studies are now in progress to look at the role of sentinel-node biopsy. This technique, first described in 1992,² involves identification of the first draining lymph node from the primary melanoma site using a combination of radioactive tracer and patent blue dye. The technique has already been shown to be a good indicator of spread of melanoma to draining lymph nodes. This could provide prognostic information and direct adjuvant therapies, potentially treating early disease spread. It has the advantage of causing less morbidity than traditional block dissections. Currently, sentinel-node biopsy should be considered for any melanoma thicker than 1 mm, but only in the context of a controlled clinical trial.

Intervention. Chronic and other difficult-to-manage wounds remain a huge treatment challenge and cost burden to the community. One of the greatest advances has been the development of low-pressure dressings.³ These dressings consist of a non-collapsible evacuation tube connected to a sub-atmospheric pressure system, which is embedded within medical-grade reticulated polyurethane ether foam dressing.



This technique removes excess interstitial fluid, increases vascularity, decreases bacterial colonisation and aids the natural tendency of the wound to contract. Additionally, it is only changed every 72 hours, thus decreasing labour costs and patient discomfort.

Another area of wound care that is being developed and used by plastic surgeons is the determination of the precise biochemical processes that control wound healing. Already, the roles of a number of growth factors and cytokines have been defined. It is envisaged that during the 21st century new treatments

will be developed to change cell function in a favourable way with the addition of positive growth factors and the removal or inhibition of negative growth factors. Some clinical trials have already been conducted using platelet-derived growth factor.⁴ Biochemical modification of wounds will have implications not only for treating chronic wounds, but also in preventing or controlling scarring.

Bioresorbable plating systems represent an enormous development, particularly in the area of craniofacial surgery. Previous systems consisted of plates and screws made of stainless steel or Vitallium. Although these materials provide rigid fixation, have excellent tissue compatibility, and are corrosion resistant, they are permanent unless surgically removed, and thus carry long term potential for infection, migration and limitation of growth. Polyglycolic acid and poly-L-lactic acid fixation systems maintain their strength long enough to allow healing, and are then broken down completely by the body, thus eliminating these long term complications.

Tissue engineering is one of the most exciting advances, and may lead to a new era in medicine: the potential to create new tissues or induce their regeneration. The basic requirements for this process are cells, a scaffold for the cells to grow on, and cellular signals or growth factors, which differentiate and stimulate cell growth. For the new tissue to be incorporated into the body, a blood supply then needs to be established. Although plastic surgeons have been “engineering” tissues for decades, these new developments raise the possibility of manufacturing tissues and organs *ex vivo*. This technology is already used in the area of burns surgery to create skin replacements when donor sites are limited by the extent of the injury.

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