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“HEAVENLY BODIES AND BLACK HOLES”

**The Inaugural Lecture
of**

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HEAVENLY BODIES AND BLACK HOLES

What is Plastic Surgery?

If asked what a plastic surgeon does, most lay people would suggest something along the lines of “nips and tucks” or “facelifts and nose jobs”. It would not occur to them that most major disasters over the last few decades - and these include the Piper Alpha Oil Rig, the Falklands War, the Bradford Football Stadium, the King’s Cross Fire - have resulted in predominantly burns casualties, usually large in number and severe in extent. When pointed out, the lay public would think of Simon Weston and that would be the limit of their knowledge. Major disasters are forgotten with the next day’s news, except by those involved.

The term “plastic” has nothing to do with the organic polymer from which the plastics in everyday use as (such cups etc,) are manufactured. In its surgical context, the term plastic refers to the physical property of some materials whereby they change shape when a deforming force is applied and return to their original shape once the deforming force is removed. This is a property characteristic of skin because of its elastic tissue content. This skin “plasticity” is what gave its name to the surgical techniques which take advantage of this “stretchiness”, and surgeons who were able to use these properties to their advantage for reconstructive purposes came to be called “plastic surgeons”.



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Originally, the plastic surgeon was concerned principally with skin, but the techniques and skills came to be applied to the handling of other tissues and different methods of skin reconstruction evolved. As the scope of the specialty expanded, so the accuracy of the term became progressively more dilute. Now, frankly, it is a poor title for the specialty.

The Senate of the Royal College of Surgeons describes the specialty as dealing with the following surgical areas:

Table 1

Cleft lip and palate
Head and neck cancer
Hand surgery
Burns
Microsurgery
Craniofacial surgery
Facial and limb trauma
Aesthetic surgery
Skin tumours
Genital deformity
Reconstructive breast surgery

While it is virtually impossible to come up with a term to describe a specialty with such a wide-ranging areas of activity and expertise, it is possible to point out a number of common themes. The specialty is not limited anatomically to one region or to one system of the body as, for example, ENT or orthopaedic surgery would be. The surgery is not confined to the skin, although this is a major part of the work. In every part of the body, there is an interface or overlap with every other surgical discipline. The only common thread running through these subspecialist fields is the association in each case with appearance and function, the term "plastic surgery" is rather more abstract than practical or descriptive.

The threat to Plastic Surgery

No surgical specialty has changed as dramatically and completely over the last 30 years as plastic surgery. In particular, the reconstructive techniques of 30 years ago are virtually all obsolete. Modern methods are simpler, quicker and more versatile, principally because of microsurgery and better knowledge of vascular anatomy. Despite this, the specialty is under severe threat and could even face extinction. This has come about for several reasons.

The first of these is plastic surgeons themselves. Until recently the advisor to the Department of Health typically has been a Home Counties based surgeon, heavily reliant on private practice for income and naturally reluctant to encourage competition by expanding the numbers in the specialty. Over many years, failure to advise in favour of expansion resulted in reduction in the size of the specialty relative to other specialties.

The second problem is the new system of health care delivery, often referred to as the purchaser/provider split. Central government, whether the Department of Health or the Welsh Office, has devolved manpower planning and development to individual hospital trusts. Funding for additional posts now has to be met out of revenue. The charges made by hospitals for their services are so farcically low that actual income never matches real costs. The inevitable result is financial stricture and little likelihood of sufficient funds for expansion of posts. The case for expansion is readily apparent from figures from the Senate of the Royal College of Surgeons (based on a 2.25 million population in South Wales):

Table 2

	Doctor/patient ratio	Ideal number	Actual number	%
General Surgery	1:30,000	75	62	82.7
Trauma/orthopaedics	1:30,000	75	42	56.0
Urology	1:100,000	23	16	69.6
ENT	1:80,000	28	23	82.1
Oral/maxillofacial	3:500,000	14	13	92.9
Plastic Surgery	1:125,000	18	6	33.3
Cardiothoracic	1:250,000	9	5	55.6
Neurosurgery	4:1,500,000	6	6	100

As a whole, these figures strongly suggest that trauma services are seriously underprovided. Not many people appreciate that plastic surgery is principally an acute surgical trauma specialty - in the South Wales Regional Unit (now based since 1994 at Morriston Hospital, Swansea), 55% of the 5,500 patients treated annually are emergency referrals. When the unit transferred, plastic surgery accounted numerically for over half the total number of emergency operations carried out at Morriston, much

to the surprise of other departments. If, as seems desired, a change to a consultant-based as opposed to a consultant-led service is to take place, this specialty requires massive and rapid expansion.

The universities are the third problem. Teaching of undergraduate surgery has been the remit of the Department of Surgery, traditionally based principally on General Surgery. Slowly, as General Surgery fragments into its constituent subspecialties and as the medical school curriculum changes, plastic surgery may find a place in the teaching of undergraduates. There is a very defensible view that plastic surgery would be a much more valuable source of teaching and training to undergraduates than General Surgery. These students, however, are also being trained as pre-registration house officers to work in General Surgical units. They form an essential and integral part of the acute service and it is unlikely that the present system could be changed significantly. The undergraduates nationally remain ignorant of Plastic Surgery in most medical schools because it is almost excluded from most curricula.

The fourth, and most important, threat to the specialty is other specialties with a drive to expand into treatment areas beyond their traditional bailiwick. The interface between Plastic Surgery and other specialties make this an obvious threat. Service underprovision is cited frequently as one justification.

The main threats currently are:

Table 3

Specialty	Area of encroachment
General Surgery	Breast reconstruction
Dermatology	Skin cancer
Ophthalmology	Eyelid surgery
Gynaecology	Perineal reconstruction
Oral and Maxillofacial Surgery	Head and neck cancer Cleft lip and palate

In theory, there should be no need for any conflict in these areas. The Calman-Hine proposals for cancer care recommended that a combined approach to treatment be adopted by all specialties with an interest. In practice this is not as effective as it should be. Aggressive acquisitive and expansionist behaviour is fostered by purchasers, providers and the Specialist Advisory Committees of the Royal Colleges individually and collectively.

Of the examples cited, it should be pointed out that "dermatological surgery" (a subspecialty of dermatology) has no formal training programme, no formal examinations, review or accreditation process, almost no access to general anaesthesia and little capacity for treating the complications of the diseases being treated or the surgery being performed. At a time of high patient expectation, low tolerance and increasing incidence of costly litigation, developed of a service run by untrained, unqualified staff is unacceptable. Such services should be replaced by properly trained surgeons.

The biggest single threat from any other specialty comes from the field of oral and maxillofacial surgery. This group of surgeons has achieved massive political success and expansion. Trainees require both medical and dental degrees. Training is now overseen by dental postgraduate Deans. As a consequence, the specialty retains a foot in dental and medical camps, and has representation on both dental and medical committees, thereby ensuring political influence far in excess of what its numbers merit. Its numbers are the direct consequence of dental manpower planning historically, hence the high proportion of actual as opposed to ideal posts (table 2).

The Future

If the specialty of Plastic Surgery is to have a future, radical change is required. Financial pressures on the NHS are going to increase, and money (or lack of it) is now the sole driving force influencing change and development. No knight in shining armour is going to ride to the rescue of any specialty. Any solution or "survival" plan will have to be generated from within the specialty, and will have to be, to use the current jargon, "cost neutral".

The specialty needs to reinvent itself in a constructive and appealing way. The problem does not lie in the work done or its quality - the image of the specialty is the biggest obstacle.

It is my view that radical change is required. I would propose that Plastic Surgery divide into its two main component parts, that all cosmetic surgery be deleted from the specialty and relegated to the private sector, and that the remaining element, the

reconstructive component, be retained in the NHS. It is in line with this thinking that this Chair has been titled Reconstructive Surgery rather than any of the possible alternatives. Such a development would make it absolutely clear to all what is the precise nature of the work of the specialty. This would, in turn, facilitate a precise definition of the boundaries of both new specialties and establishment of areas where genuine collaboration can take place with other medical and surgical disciplines. It might also lead to transfer of certain conditions or areas of activity from one specialty to another - why, for example, should not all breast surgery be carried out by "reconstructive" surgeons?

Techniques should also continue to develop and evolve - reconstructive surgery must continue to justify its existence. Thirty years have elapsed since the axial flap revolution, twenty years since microsurgery was introduced - reconstructive advances have been refinements mostly, nothing genuinely new has come along. The specialty is stagnant.

The most likely areas for significant progress and change are:

1. Foetal surgery
2. Tissue (cadaver) transplantation
3. Scar-free wound healing
4. Culture of tissue for clinical use

Foetal Surgery

Injury or wounding of the foetus in the womb results in scar-free healing, but this capacity is lost immediately after birth. The reason for this is not known.

The main problems with intrauterine surgery are:

1. The risk to survival of the pregnancy
2. Antenatal diagnosis is not 100% accurate
3. Maternal scarring
4. (Plastic) surgery is for purely cosmetic reasons eg cleft lip repair

This creates major ethical problems - one can imagine the consequences for an elderly primigravida after fertility treatment who elects to have her developing baby operated in utero for repair of a cleft lip only to find at surgery that the lip is normal and then to miscarry because of post-operative infection. The example may be extreme but it illustrates the risks. This is, in my view, not an avenue worth pursuing for other than potentially lethal developmental problems.

Cadaver transplantation

Since Louis Washkansky became the recipient of the first heart transplant, cadaver tissue transplantation has become extensive and widespread. Some transplants cannot be rejected eg corneal grafts and organs from identical twins. Some transplants are life-saving (e.g. lung, heart, liver) but some transplants are carried out principally to enhance the patient's quality of life. The best example of this type is the kidney. All these organs are at risk of rejection despite advances in drug treatment to prevent this. Rejection of heart, lung or liver is potentially fatal but kidney rejection means a return to dialysis. Life expectancy of renal transplant patients is the same as for those on dialysis - the new kidney gives them a life independent of the machine.

The quality of life issue raises the possibility of using cadaver tissues to transplant for reconstructive purposes. Such a development raises serious ethical questions because the human body has more than enough sources of autogenous transplantable tissue to satisfy virtually every conceivable need. Kidneys and other organs can come only from another human being, whether moribund or dead. This natural, living "storehouse facility" makes cadaver transplantation a doubtful avenue to explore and develop.

The last two possibilities bring us away from the hospital and the operating theatre and into the world of the university and the laboratory. For it is here that I foresee the next major steps being taken in the world of cell and molecular biology - an area unfamiliar to most surgeons.

Scar free healing

The discovery of cytokines, molecules which regulate cell proliferation among other things, has prompted interest in the possibility of using those with anti-collagen or anti-fibroblast effects to inhibit scar formation or stimulate healing by reconstitution of tissues by regeneration, in much the same way as happens in the embryo. Promising results have been obtained using transforming growth factor - β_3 and this has almost reached the stage of clinical trials. This work has been carried out in Manchester and it is doubtful if Swansea has any real role to play in this.

Tissue culture

This is the field chosen in Swansea for investigation and development. Our work has been confined thus far to skin, but by using the chorioallantois (CAM) of the chick embryo, it has been possible to study human skin rather than animal models.

Cultured skin has been used by us in human volunteers on a trial basis but the difference in clinical behaviour by comparison with normal skin (when used as a graft) has been striking. Cultured skin has worked well when used electively but not when used in treating burns or other conditions in which when infection is a problem. When successful it is noticeable that scarring around the margins is negligible and the contour defect is not significant - the overall appearance is superior to the traditional skin graft in many respects.



Autogenous human skin grafts acquire a blood supply from their bed after 48 hours and this is reflected, when glucose and ATP levels are measure, in a rise in both in the graft.

Cultured "skin" is an analogue consisting of a denatured collagen substrate impregnated with cultured fibroblasts and covered with a layer of cultured keratinocytes. It lacks elastic tissue, blood vessels, hair follicles, sweat glands and pigment-producing melanocytes, but it is the closest to normal skin yet produced in the laboratory.

After application to a suitable bed glucose levels are initially high because the tissue comes straight from culture but these levels remain low and ATP production remains very low. This suggests that the cultured skin is very slow to acquire a blood supply and is, in fact, surviving by diffusion of nutrients from the bed.

This explains why such grafts have failed in clinical practice - incorporation of blood vessels into cultured grafts could be the making of this technique and, if successful, would represent a significant advance in patient care. Currently, we are trying to do this using umbilical vein vascular endothelium - so far with limited success.



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