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科技热点系列  
Science at the Edge Series

人体美容

# Body Sculpting

Sally Morgan

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<http://www.21books.com> <http://www.cqchina.com>

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# Introduction

In 1992 Louise Ashby was 22 years old, and dreamed of an acting career in Hollywood. One night, as she and a friend were driving home, another car crashed into them. Louise was seriously injured, and the left side of her face was virtually destroyed.

A few decades earlier, Louise would have had to learn to live with her disfigured face. But over a period of ten years her appearance was gradually restored to normal, thanks to advances in the field of plastic surgery.

## Plastic surgery

The word 'plastic' in plastic surgery does not refer to using plastic materials. Another meaning of the word plastic is 'capable of being moulded or of receiving form', and this is what is meant in plastic surgery. Plastic surgery involves processes such as moving skin and **tissue** from one part of the body to another, stretching things out and reshaping them.

There are two uses for plastic surgery – reconstructive surgery and **cosmetic** surgery. Reconstructive surgery is carried out in order to restore a more normal appearance to abnormal or injured parts of the body, as in the case of Louise Ashby. The repair of wounds and **fractures** of the facial bones are common procedures in plastic surgery. Other examples include the removal of skin cancers, repair of genetic defects and repairing skin damage caused by burns.

Cosmetic surgery is performed to enhance the appearance rather than to correct injuries or abnormalities. Common kinds of cosmetic surgery include **facelifts**, nose reshaping, and removal of fat. In recent years there has been a great upsurge in the popularity of cosmetic surgery in richer countries, particularly in the USA. In 2002, nearly 7 million cosmetic procedures (both surgical and non surgical) were performed in the USA, more than three times the number in 1997. Over 80 per cent of those who had cosmetic surgery were women, although the number of men has risen rapidly in recent years.



During the Falklands War in 1982, British soldier Simon Weston suffered burns to almost half his body. Since then he has undergone over 75 painful operations to repair the damage. Simon's life is an example of personal courage and triumph over suffering. Despite his severe injuries, he undertakes endless charitable work. In 1992 he was awarded the OBE.

## Cosmetic concerns

Plastic surgery raises many issues. As advances in technology mean that more procedures can be carried out more readily, there are increasingly difficult questions to consider. What happens when cosmetic surgery goes wrong? Should young people have cosmetic surgery? Is it ethical for doctors to completely change the appearance of their patient? In this book you can read about plastic surgery, and learn more about these issues. You can learn about the techniques used by surgeons and the science behind the technology. Find out also how technologies such as cloning, brain transplants and **virtual reality** may shape the future of plastic surgery. Decide for yourself whether cosmetic surgery is a good or bad thing.

# The rise of plastic surgery

Reconstructive surgery was probably first used in India in approximately 600 BC, when doctors used skin from the forehead to rebuild the noses of people who had had them cut off as a punishment. However, it was not until the development of **anaesthesia**, towards the end of the 19th century, that the first real advances in plastic surgery took place.

There were further major developments during World War I. Thousands of soldiers were badly wounded on the battlefield. Never before had such large numbers of soldiers been so severely injured. Doctors, such as the French army surgeon Hippolyte Morestin, had to learn how to deal with severe facial injuries, burns and lost limbs. It was from these first experiences of reconstructive surgery that surgeons developed techniques for plastic surgery on the nose and the face. Advances in reconstructive surgery were also made during World War II.

During the 1950s implants to enlarge breasts were used for the first time, and **liposuction** (the removal of fat) was developed in the 1970s. Since then plastic surgery has developed rapidly, mainly because of advances in equipment – for example, the development of **endoscopes** and laser surgery.

## What is beautiful?

Many people have cosmetic surgery in order to make themselves more beautiful. But what is considered beautiful in one society can be considered completely unattractive and undesirable in another.

Fat is often thought to indicate that a person is healthy and well-off. In many parts of West Africa, a full body is considered highly desirable and linked to fertility. In some cultures young women planning to get married eat heavily before their wedding in order to put on as much weight as possible. In fact, there is medical evidence to suggest that women who have fat around their hips and less on their waist are less likely to suffer from infertility problems.

In modern Western society, a slim woman is considered beautiful and many women will undergo cosmetic surgery to reduce the fat on their hips and **buttocks**.

*'Until I came to America, I never knew thin was beautiful.'*

Young male exchange student from the Ivory Coast

In many cultures, exaggerated features such as extra-large ear lobes, big lips, long necks or tiny feet are considered to increase the attractiveness of women. For instance, some Senegalese women increase the natural thickness of their upper lip by pricking it repeatedly until it is permanently inflamed and swollen.



In the Karen Padaung tribe of Burma, a long neck is considered beautiful. When a girl reaches the age of five, she is given her first neck ring and as she gets older, new ones are added. The rings stretch her neck until it is about 30 cm long. In some areas the Karen Padaung put large pieces of ivory in their ear **lobes** instead of wearing neck rings.

## Lotus Feet

One of the more extreme examples of altering parts of the body is the ancient Chinese custom of foot binding. Tiny feet, called lotus feet, were considered a sign of beauty and attractiveness in women. Young girls from wealthy families would have their feet bound when they were about five years old. Their toes were bent under and bones were broken to force the front and back of the foot together. At the end of this binding process the young girls had feet about ten centimetres long. However, these tiny feet meant that the girl could only **shuffle** around and often had to be carried.

## Media pressure

Today the idea that it is desirable to be young and slim is reinforced everywhere we look. 'Perfect' faces and bodies appear on magazine covers and TV screens and stare down from advertizing **hoardings**. It is not surprising that young people today worry about their appearance, and older men and woman try to look younger.

However, what we see in photos and on films can be an illusion. Faces are often retouched to remove the slightest spot, **blemish** or **wrinkle**. Sometimes photos are stretched to make a person looks taller and thinner. In films, star actors often have a 'body double' – someone with a fit, well-musclcd body who stands in for the actor in some shots.

In an attempt to live up to these ideals, more people than ever are undergoing plastic surgery, especially cosmetic surgery. Traditionally it is women who opt for cosmetic surgery, but the numbers of men having cosmetic procedures is growing fast. They now make up about 20 per cent of plastic surgery patients, double the percentage of fifteen years ago.

## Risky business

All surgery is risky, and plastic surgery is no different. Reconstructive procedures can be long and complex, and things can go wrong. Patients are made aware of the risks, but for them the benefits of a normal appearance far outweigh any risk.

Cosmetic surgery is different. Patients choose to have surgery in order to improve their appearance – so is the risk worth it? Not surprisingly, patients are very unhappy when things go wrong and they end up with a disfigured face or a scarred body. They may need to have further operations to correct the mistakes of the first one.

The problems caused by mistakes in plastic surgery are not just physical. Patients can suffer emotionally and psychologically as well. Often the victims of mistakes feel guilty or think that they are being punished for vanity. As cosmetic surgery increases in popularity, awareness of the risks becomes more important.



The American actress and singer, Cher, makes no secret of the fact that she has had cosmetic surgery - but is it worth the risk?

# The plastic surgeon's toolbox

In recent decades plastic surgery has changed out of all recognition. Today's surgeons can suck fat out of the body, move tissues from one area to another, and rebuild damaged parts using bone and muscle from elsewhere. In order to carry out these complex operations, surgeons need specialist equipment and techniques. This chapter takes a closer look at the plastic surgeon's toolbox.

## Endoscopy

The endoscope is an instrument that allows a surgeon to look inside the body without opening it up. It consists of a snake-like tube containing optical fibres connected to a tiny camera and a bright light. The tube is inserted through a small incision (cut) and manipulated until the end reaches the site where the surgeon wants to operate. The optical fibres send images from the surgical site to a tiny camera. The images are magnified on a viewing screen, allowing the surgeon to view the surgical site almost as clearly as if the body had been cut open.



During an endoscopic operation, the surgeon views the operation using a video camera attached to a tube carrying optical fibres, which is inserted into the body. Surgical instruments are also inserted down one or more other tubes.

Endoscopes can also be used to carry out operations. To do this, tiny surgical instruments such as **scalpels** or **forceps** are inserted down another tube through another small incision. The surgeon uses the endoscope to watch what he is doing at the surgical site.

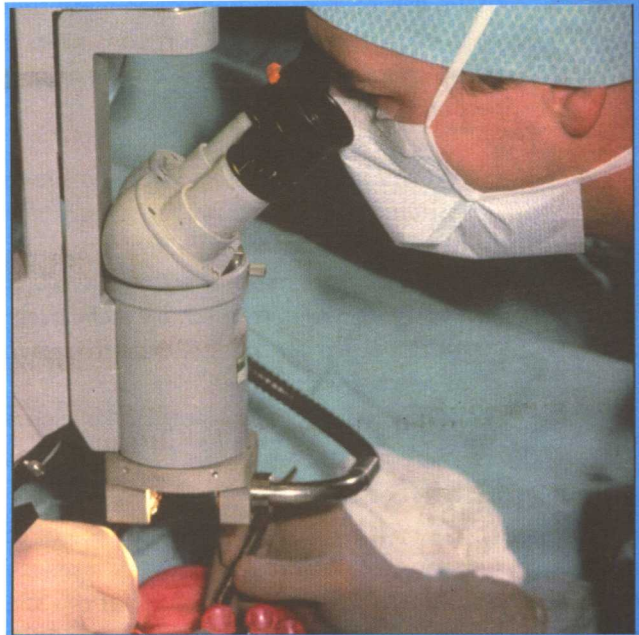
There are several advantages to doing endoscopic operations. Instead of the large incision needed in a conventional operation, only a few small incisions, each less than a couple of centimetres long, are needed to insert the endoscope probe and other instruments. This means that there is less likelihood of nerve damage, less bleeding and swelling and patients recover more quickly. An endoscopic breast reconstruction, for instance (see pages 22–3) can be carried out with just three or four short incisions.

*'You are looking at a flat TV monitor, and operating a very thin instrument through very small holes in the **tummy**. So even just appreciating that and working in a **three-dimensional** space is very difficult.'*

Abdominal surgeon, Dr Nick Taffinder

## Microsurgery

**Microsurgery** has allowed plastic surgeons to carry out incredibly delicate operations in which tiny blood vessels and nerves are rejoined. Before the advent of microsurgery, if you had a severed finger or a big open wound on your body, there was little that could be done. Today it is likely that the surgeon can rejoin the finger or take tissues from other parts of the body to repair an open wound.



During microsurgery, operations are carried out while viewing through the microscope. The needles and **sutures** used to **stitch up** wounds have to be small so that they do not damage blood vessels and nerves.

## Tissue flaps

One common procedure in reconstructive surgery is the removal of a piece of skin, muscle and blood vessels from one part of the body for use in rebuilding another part. Such pieces of tissue are called flaps.

Tissues receive blood through tiny blood vessels called **capillaries**. The blood brings oxygen and nutrients to the tissue cells. When tissues are moved, the surgeon has to ensure that the cells have a blood supply, otherwise they will starve of oxygen and die. A tissue flap will also usually contain some nerves, and these have to be reconnected so that the patient has feeling in the part of the body being rebuilt.

Sometimes a surgeon removes the blood vessels along with the tissues and then reconnects them when the tissue has been moved. The surgeon may even include large blood vessels in the tissue flap. Alternatively a tissue flap can be removed without a blood supply and then connected up to local blood vessels in its new position.

Under normal conditions a blood vessel that is cut or damaged will constrict (close up) to cut off the flow of blood. But blood vessels in a tissue flap have to be kept open at all times so that they can be joined up in their new location. Surgeons keep the blood vessels open during tissue transplants by using a drug that stops the normal constriction response.

*'When I first started there were no sutures, no needles, and no instruments small enough for surgery of this type. I used to make the needles myself under the microscope, and we borrowed or copied jewellers' instruments. A big breakthrough came from the **Silicon Valley** and its microassembly techniques. Engineers were able to make needles for me that were thinner than your hair and drill the needle eye with a laser.'*

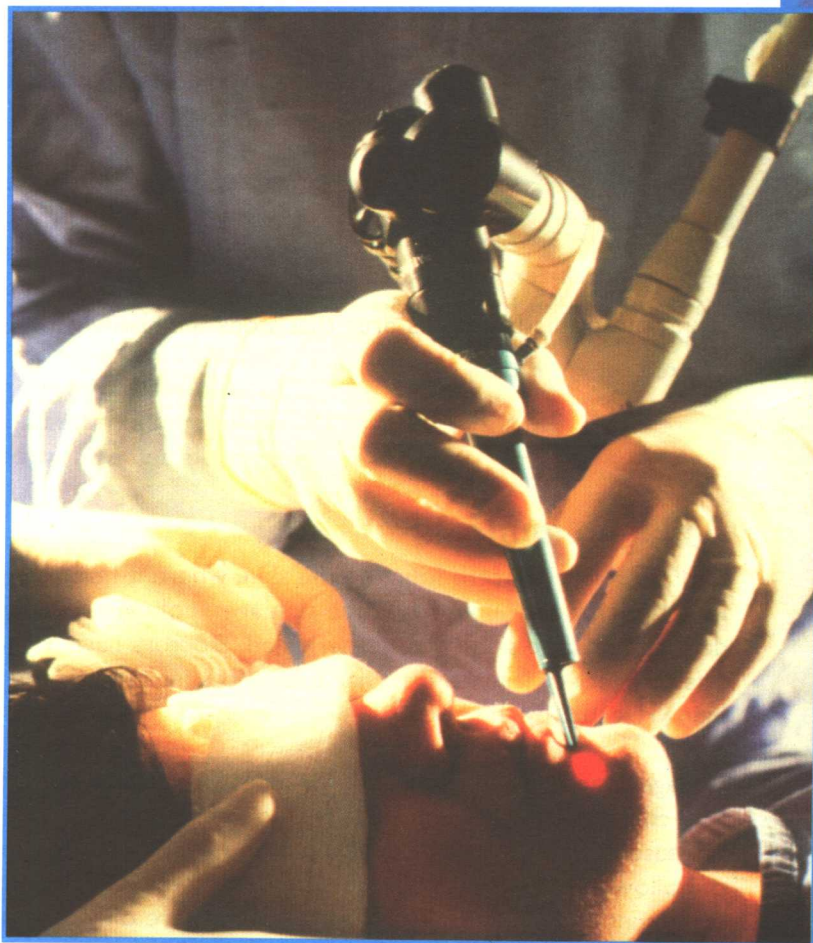
Dr Harry Bunke, pioneer in the field of microsurgery

## Lasers

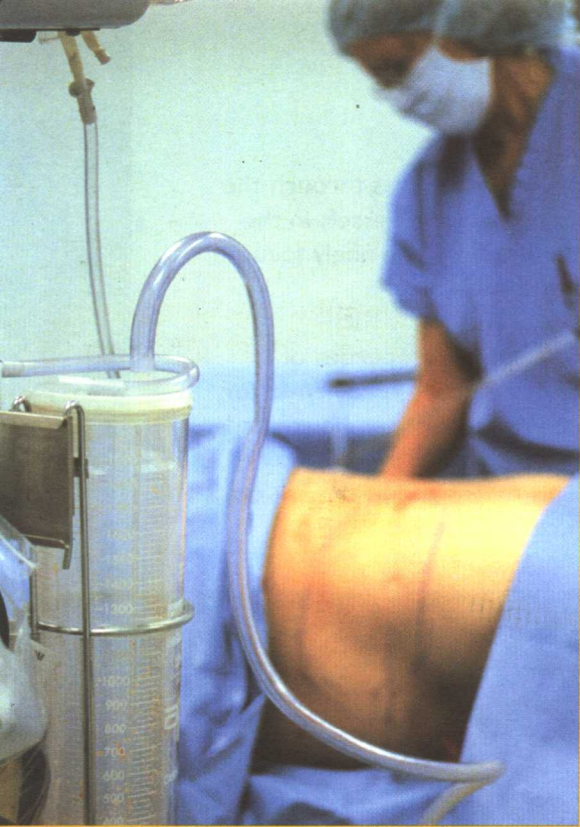
The laser is another important piece of equipment for the plastic surgeon. A laser produces a very intense beam of light of one wavelength (light of one colour of the spectrum). A beam of laser light concentrates a large quantity of energy into a small space, making the laser a very powerful instrument.

Lasers are widely used in plastic surgery. The laser cuts through the skin like an ultra-fine scalpel. Its heat seals the blood vessels in the instant that they are cut so there is little bleeding. The finely focused beam of light improves the precision of the surgeon.

A new trend in laser surgery is to use the special properties of different wavelengths of laser light to treat a range of problems. For example, red birthmarks known as 'port wine stains' can be treated using yellow laser light, which is more strongly absorbed by the red port wine stain than by other tissues. This means the birthmark can be destroyed without affecting the skin cells around it.



Lasers are an important new tool for plastic surgeons. They can be aimed down blood vessels or sent down optical fibres in endoscopes to reach areas that are otherwise inaccessible. Here the laser is removing a mark on the skin.



Liposuction is a popular procedure used to remove fat from areas such as the stomach, hips and thighs. As the name suggests, fat is literally sucked out of the body.

## Liposuction

A popular cosmetic procedure is liposuction, a technique for removing fat to reshape the body. Before liposuction was developed in the 1970s, fat deposits were removed by cutting them out with a scalpel, which often gave uneven results and caused heavy bleeding. Today the surgeon injects the fatty area with a large quantity of **anaesthetic** liquid that deadens the pain and causes the pockets of fat to become firm and swollen. A thin tube is inserted into the area and a vacuum pump sucks out unwanted fat.

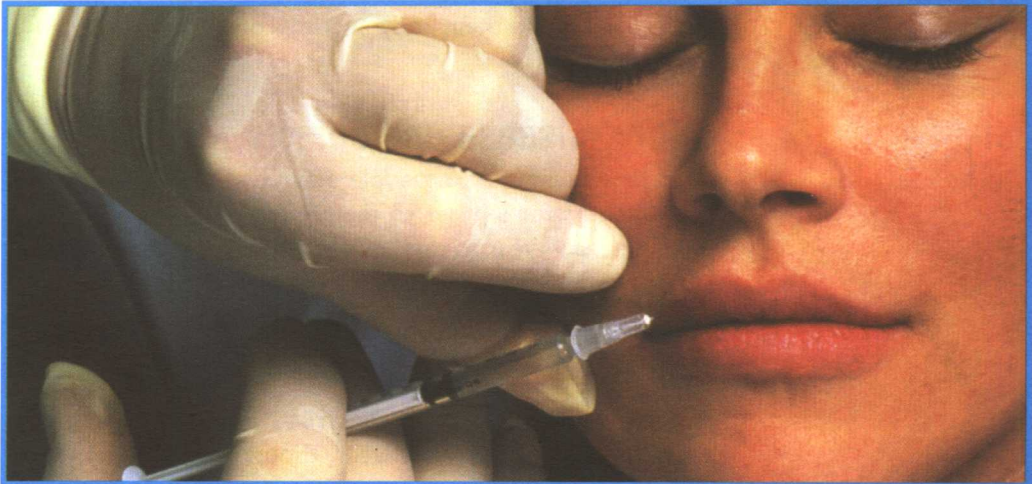
Liposuction is the most common cosmetic surgery in the USA. Nearly 373,000 procedures were performed in 2002. However, liposuction is not a substitute for diet and exercise, nor is it a cure for **cellulite** (the **dimpled** skin often found on the thighs, buttocks and **abdomen**).

## Collagen implants

**Collagen** is a **protein** found in the skin, where it helps to give the skin its **elasticity** and support. As the skin ages, collagen is broken down or damaged and the skin becomes wrinkled. Doctors have found that it is safe to inject collagen and similar substances into the skin without them being rejected by the body.

Collagen can be used to remove wrinkles, but also to enhance the lips. The collagen is injected into the edge of the lips, causing them to increase in size. Collagen can also be used to improve the appearance of hollow cheeks in patients suffering the side-effects of various drug treatments. The effects of collagen injections are only temporary, lasting about three to six months. The implanted collagen is gradually broken down and reabsorbed by the body.

There are a number of **synthetic** materials that can be used in the same way as collagen. However some people are allergic to the synthetic alternatives.



Collagen treatment involves simply injecting collagen into the skin using a very fine needle. The collagen fills out the skin and reduces the appearance of lines and wrinkles. Here the collagen is being injected to enhance the lips.

## Fighting rejection

Although collagen can be injected into the body without ill effects, in other areas of plastic surgery **rejection** can be a major problem. Initially the **grafted** skin looks healthy and develops blood vessels, but soon the blood vessels break down and white blood cells gather around the skin graft (white blood cells help defend the body against disease). A few days later the skin graft begins to die off. It is killed by the white blood cells and other body defences, which do not recognize the graft as being part of the body.

Rejection of a graft can be prevented by using **immunosuppressing** drugs (drugs that stop the body's defences from attacking the graft). However, such drugs leave the patient **vulnerable** to infection because they affect the whole of the body's immune (defence) system, not just the part rejecting the graft.

# Body reconstruction

A few decades ago, a person badly disfigured in a fire or an accident would have had to live with the change in their appearance and the problems associated with it. Today, advances in reconstructive surgery mean that a surgeon can often rebuild their body and improve their quality of life.

## Injury, disease and defects

A surprising number of people may need treatment during their lifetime for injuries to their face or body. For example, each year in the UK more than a million people suffer facial injuries. The majority of serious facial injuries affect young people and are caused by accidents, fights or by drunken behaviour.

People may also require reconstructive surgery after treatment for cancer. Each year, thousands of women have to have cancer tissue removed from their breast, but surgeons can now use various techniques to reconstruct the breast afterwards (see pages 22–3). Mouth cancer can also cause disfigurement. It is the sixth most common cancer in the UK and it affects the tongue, cheeks and parts of the throat. Treatment for this cancer can involve the removal of large areas of diseased facial tissues. The patients have to deal with both the disease and a disfigured face.

Thousands of babies are born each year with genetic defects such as **cleft lip** and **palate**, double noses or displaced eyes. These are called congenital (inherited) deformities. In countries with a good standard of medical care, these defects are routinely treated by reconstructive surgery.

*'It is thanks to micro-vascular surgery like this that we can now rebuild people's faces. Before, the bone grafts simply died. There has been a dramatic improvement in reconstruction over the past 10 or 15 years. We can now remove huge and aggressive cancers and instead of leaving patients with a gaping hole in the side of their faces, we can rebuild them.'*

Iain Hutchinson, **maxillofacial** surgeon,  
Royal London Hospital