

When a surgeon becomes a sculptor

Scientists may one day be able to grow ears in the laboratory for children born without them. But, for now, replacement ears are often made from human rib cartilage, writes **Rebecca Palmer**.

► EAR ANOMALIES

Microtia literally means "small ear". It is used to describe an incompletely formed ear, which occurs in one in several thousand births. It is thought to be more common in some populations (such as the Japanese and Navajo Indians) than others. In 90 per cent of cases, only one ear is affected. The right ear is more likely to be affected and males are more likely to have microtia than females. Microtia can be isolated or part of other facial abnormalities.

Atresia, which usually accompanies microtia, is the absence or underdevelopment of the ear canal and middle ear structures. This means the patient can't hear through that ear, though hearing in the other ear is usually normal.

Anotia describes the complete absence of the outer ear at birth and is often associated with other conditions, including hypothyroidism.

KATE MACRAE will have an unusual request for her surgeon the next time she goes under the knife — she'd like her ears pierced at the same time.

The 10-year-old Kapiti Coast girl was born with one functioning ear and only remnants of the other. Now she has a new ear, constructed from cartilage from her ribs. At first glance, it looks the same as her other one.

In September, plastic surgeon Charles Davis opened her chest and "harvested" cartilage from her rib cage — a process Kate describes as "a bit scary" to think about.

Mr Davis then used four pieces of the cartilage to sculpt an ear shape, held together with wire. The framework was inserted beneath a pocket of skin in an operation that took about five hours.

Kate's mother, Shona, says the result was amazing. "When she went into surgery, Neil [her father] took her in. She had one ear.

"I went in to get her out of recovery and there she was with another ear.

"We expected it to be bandaged up. We hadn't expected it would be so visible straight away."

But the new ear is still a work in progress. At the moment, it sits flat against Kate's head and a second operation is needed to make it stick out.

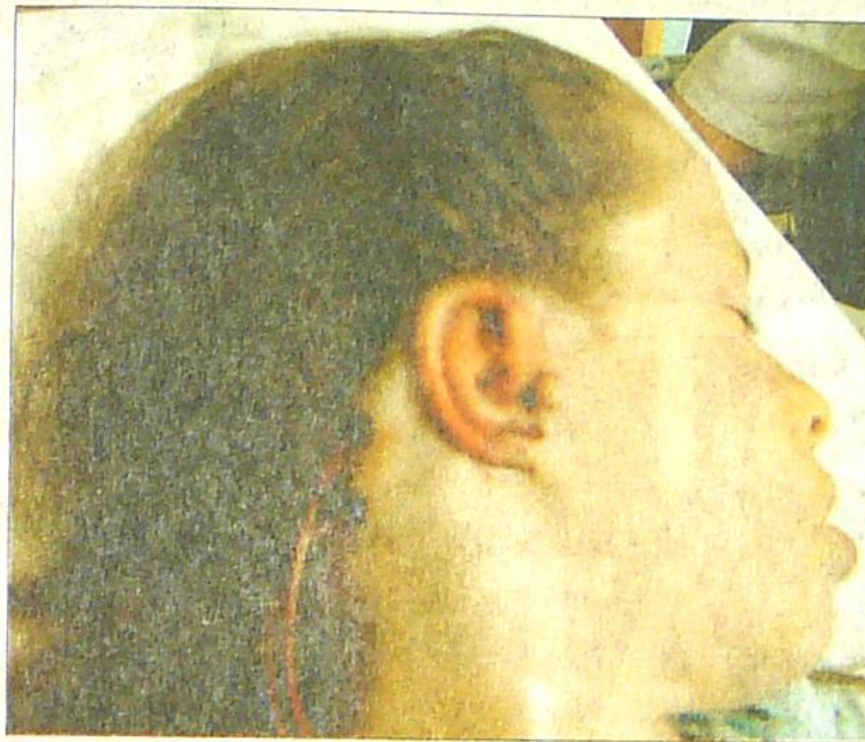
This can only be done several months after the first surgery. "We give the skin enough time to develop and get a good blood supply over the top of the cartilage," Mr Davis says.

In the next step, he will create a groove behind the ear and elevate the framework.

A flap of tissue from Kate's scalp will be used to cover the back of the cartilage and a skin graft will cover that.

Kate spent five days in hospital for the first operation and will be in for two days the next time round. She figures that since she has to go through the pain of a second operation, she might as well get her ears pierced at the same time.

External ear reconstructions are



Model patient: Kate Macrae after the surgery that created a new ear from her rib cartilage

purely cosmetic and do not improve hearing.

"It's not absolutely essential to have it done," Mr Davis says. But he adds: "It's a nice thing to do for somebody."

Surgery can help affected children feel more confident and spare them teasing by other children.

Mrs Macrae says: "We wanted it fixed for her sake. If your child needs glasses, you get them glasses."

Mr Davis has about 50 patients waiting to have ears reconstructed, half of whom are old enough for the procedure.

Ears grow to adult size earlier than other parts of the human body and a child's chest takes a while to catch up. Ear reconstruction is usually postponed till patients are at least 10 years old, so there is sufficient rib cartilage for the framework.

Because the problem is not life-threatening, families can face a long wait for surgery.

"We can't do these children as quickly as we would like to because of the pressure on the waiting list," he says. "There are a lot of more urgent cases that jump the queue."

Consequently, he tends to fit in ear reconstructions around his other work at the Wellington regional plastic, maxillofacial and burns unit at Hutt Hospital.



Ears are complex and unique structures . . . and it is tricky constructing one out of bits of rib in the operating theatre.

Plastic surgeon Charles Davis

If he has not sculpted an ear for a couple of months, he might practise the night before on a potato or another object.

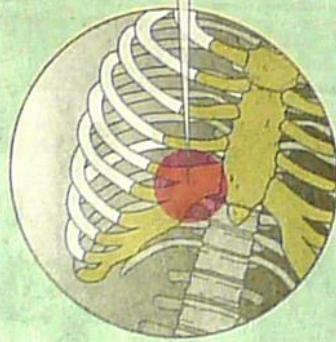
Ears are complex and unique structures — "they are all very, very different" — and it is tricky constructing one out of bits of rib in the operating theatre.

▶ EAR CONSTRUCTION

Kate Macrae was born with only remnants of her right ear, a condition known as microtia. Wellington plastic surgeon Charles Davis created an ear for her, using cartilage taken from her rib

cage. The surgery to remove the cartilage from her chest and make the ear took more than four hours. She will need another operation later to elevate the ear and make it stick out.

1 Cartilage harvested from Kate's rib cage.



2 Ear framework constructed from four pieces of carved rib cartilage held together with fine wire.



3 Framework inserted beneath ear skin.



Source: CHARLES DAVIS Graphic: RICHARD PARKER

The child's other ear can be used as a template if it is normal.

At some stage in the future, it is likely surgeons will be able to grow ears without having to remove whole pieces of rib cartilage, he says.

"What you would be able to do is take a little bit of rib cartilage and grow it into the shape of an ear."

The process would be somewhat similar to the infamous human ear grown on the back of a mouse.

Mr Davis says plastic frameworks are sometimes used to rebuild an ear instead of cartilage. But he does not use them because they can get damaged, rejected or infected. Ears created from rib cartilage are alive and can actually grow with a child, while ears constructed from plastic cannot.

Another option is a prosthetic ear — a "clip-on job". But these look less natural and can fall off or be pulled off. Their colour can also fade over time and they do not blush like other parts of the body.

However, they may be needed for people who have been badly burnt on the side of the head and do not have enough tissue for a surgical reconstruction.

Besides surgery to give her the look of an ear, Kate previously had two operations in Auckland to have a hearing aid fitted. She has no ear

canal or eardrum and is reliant on a "bone-anchored hearing aid" for hearing on her right-hand side. The aid allows sound to be conducted through the skull bone, bypassing the middle ear.

In the first operation, an internal component, made of titanium, was fitted underneath the skin behind her ear. Over time, the titanium integrates into the skull bone, allowing sound vibrations to be transmitted.

In the second operation, a small segment of Kate's skin was removed and an external attachment fitted to the titanium implant.

A detachable hearing aid is attached to the external component, which looks a bit like a small dome behind her ear.

Kate can hear well from her normal left ear and since her ear reconstruction has not been using her hearing aid, much to her parents' frustration. She is worried it sticks out too much, though it is covered by her hair.

She will be less self-conscious once her new ear is complete.

She plans to pull her hair back into a ponytail more often and is already looking forward to wearing earrings.

"People used to tease me when I didn't have my ear," she explains. "They can make fun of me and that's not nice."