

## OLD HIPS PUT TO GOOD USE AN ORTHOPAEDIC SURGEON'S STORY



Boxes of replacement hip joints (photo: Ann Lingard)

Andrew meets me in the wide, well-lit corridor by the Main Theatre in the Infirmary; he is in his late fifties, greying, and wearing a dark suit, white shirt and colourful striped tie. Quietly-spoken and initially somewhat diffident, he has invited me to meet him to talk about the collection - 'retrieval' - of donated [femoral heads, the ball of bone that forms part of a hip joint](#).

Jennifer, the Orthopaedic Theatre Sister joins us and the three of us go to a small office to talk about hip surgery. They make a good team and have a relaxed rapport, both quietly enthusiastic about what they do, and interrupting or adding to each other's statements. Jennifer, an attractive woman, dressed in the standard hospital gear of blue tunic and trousers, pale blue hospital 'clogs', and with dark hair just visible beneath her blue snood, has worked in operating theatres for 26 years, and in the Orthopaedic Theatre for 11 of those. She tells me later that she lives on a farm, and her husband is busy lambing at the moment.

Andrew chose orthopaedics because "it was the only thing I found at all interesting in medical school. I didn't do biology, I wasn't interested in looking at pink and blue splodges down microscopes, I really wanted to do physics. When I was in my third year, a really inspirational professor who had arrived from Chicago gave a very good lunchtime lecture and I thought, 'That's the sort of thing I could get into.'

I was more interested in physics, I still am, I read physics all the time."

He laughs and agrees when I suggest he is a frustrated engineer. "You've got to be able to see things in three-D in your head - I can visualise a mathematical shape and turn it round in my head and look at it from different angles" - a useful skill when working with that most three-dimensional of all our joints, the ball-and-socket of the hip and pelvis. Perhaps it's because of this that Andrew prefers to concentrate on hip replacements and revisions rather than knees; he estimates that he does approximately 150 primary replacements and 30-40 'revisions' per year. He is due to retire next year, and says he is looking forward to it after 24 years in orthopaedics. "Won't you miss us?" Jennifer asks, jokingly, and he smiles: "I'll think of you when I'm sitting with a glass of wine somewhere in France!" But after he has left the office,

Jennifer says he is one of the best at his job, very caring and careful to do the best job for each patient, according to their age and needs.

When the ball-and-socket hip joint has to be replaced, the bony femoral head has to be sawn off and removed: if there were no further use for it, it would be "chucked in the bin", but in fact it can be used to supply bone for a graft in future hip operations.

To understand why bone grafts might be needed, we need to understand what a hip-joint replacement entails, and Andrew explained the details very graphically. (If you are squeamish, or about to have one of your own hips replaced, you might want to skip to further down the page.)

Briefly: after the upper part of the leg has been opened up, the hip joint is dislocated, the femoral head exposed and removed, the socket in the pelvic girdle is reamed up, and the core of the upper femur - the 'hollow' where the bone marrow resides - is further hollowed out. Angles, diameters and lengths are measured carefully and tested, often with the aid of X-rays; suitable metal sockets, ball joints and the metal shafts (stems) that go down inside the femur are selected - and eventually the pieces are hammered and also sometimes cemented into place; Andrew prefers the uncemented technique. There are further choices: the artificial femoral heads can be made of metal or ceramic; the other side of the articulation can be made of plastic, metal or ceramic; the sockets and stems might be smooth metal or coated in porous metal or hydroxyapatite (a form of calcium phosphate that is the mineral component of bone - living bone grows into the hydroxyapatite).

"We have a fairly free hand as to the materials and method we use. But every joint replacement in the country should go into the [National Joint Register](#). This way, the revision data can be matched up to the primary data. We can see which joints, hospitals, and surgeons are working better. Surgeons can log in, so you can see how you're doing compared to everyone else. But the data is only as good as what's put in, the data can be skewed. Unfortunately it isn't mandatory to enter the data, as in Sweden, which is a problem."

"A surgeon might change technique with experience, or because of the price, or new techniques. We can look at all the big registers, from Sweden and Norway ... There are people sifting through the data and writing papers for the journals. So you know what's going on ..."

If a primary replacement fails (or has unexpected side-effects - there is anxiety at the moment about heavy metal ions released from some metal-on-metal joints) it may have to undergo 'revision' - replacement of the replacement. When I was at the Infirmary I watched the end of a revision operation, where the primary metal stem and head had had to be removed and replaced; X-rays to show how the stem had slipped sideways within the femur were up on the screen, and the discarded stem and the pinkish-white ceramic head lay on the trolley.

When preparing for revisions the surgeon often finds there's been osteolysis, in which the patient's bone has been destroyed around the area of the joint. This is where bone grafts come in.

"When I first started you couldn't get hold of femoral heads," Andrew told me. "We scraped bone from the back of the pelvis, from the iliac wings - but that meant I'd have to do an extra incision and the operation would last a further forty minutes. Now we can ring up Liverpool [Tissues Services] and say we'll need three femoral heads. They'll send them up and we put them in the freezer and only take them out when we know we'll definitely need them. Then we take off the soft tissues and we put them in a sort of grinding machine."

The ground-up femoral heads are washed with pressurised fluid, in the bottom of a metal dish, and the fluid is sucked off until it's almost clear. Jennifer says, "It's blanched, you can see it turning white." The bone, which is now in the form of small chips, is 'impacted in', in other words banged firmly into the hole and other defects.

I'm surprised to discover that it isn't necessary to tissue-type bone for this operation. I wonder if this could be because the joint is not well-vascularised, and so could act as a 'privileged site', more or less hidden from recognition and attack by the immune system; but Andrew says the area has a very good blood supply, and isn't able to offer an explanation. Whatever the reason, the result is that the recipient's bone cells invade the graft and start to re-model it.

"The bone becomes 'live'. Over time it comes to look like normal bone. It's amazing how the body takes it over and remodels it, probably in three to six months, although you can't see much change on the X-rays for one or two years," Andrew says. "Two years later it has been completely re-modelled, especially in the socket - though not usually so well in the femur. The stresses and strains in the socket must help." Cells lay down bone along lines of tension and compression - a clever engineering trick by the growing tissues.

So how does one go about donating a femoral head for bone grafts? There's information on the [NHS Blood & Tissue website](#), and if you are about to undergo a hip replacement, it's a fairly simple process to arrange for donation at the Infirmary. You will be invited to a Hip & Knee Meeting, where a specialist nurse will discuss the question of giving femoral heads, and has the relevant information and consent forms.

Jennifer says, "A lot of the patients are really keen to give. It's very strict, we have to do everything in terms of the Human Tissue Act. Every femoral head has an audit trail, and we're regularly monitored to check we're doing it properly.'" The donations are carried out under the umbrella of the regulations for NHS Blood & Tissue.

If consent is given, the femoral head is sawn off at the start of the operation, put in sterile pots and frozen at -70°C. The Infirmary has a special licence which allows them to store femoral heads for up to a month, and the collected frozen heads are then taken to the [NHSBT Tissue Services tissue bank](#) at Speke, near Liverpool. (Tissue Services also acts as a bank for heart valves, tendons and other tissues.) Here, the femur and related blood samples are

screened for various mandatory markers as well as for possible contamination with bacteria or fungi. Bone samples are kept for six months, in case other contra-indications for use come to light, and none is released for use until it has been screened and cleared.

It's a system that seems to work well, and had enormous benefits to the patients. As Andrew says, "Without bone we'd be in trouble."

But the cost of a revision operation is something that frustrates and angers Andrew and Jennifer: as soon as we met and started talking about using femoral heads, they launched into a two-hander about the costs:

"We get about fifteen to twenty pounds for each one for which we get consent, but the licence costs quite a lot of money."

"And then we pay seven hundred pounds for each head when they come back from Liverpool. The hospital is on a 'payment by results fee', with a fixed tariff for each type of operation. If you consider that for a hip revision we might use two- or three-thousand pounds-worth of metal ... if we use expensive kit ... and we have to use bone from several heads, the tariff nowhere near covers the cost."

"The theatre session might last four to five hours, there could be seven or eight people in theatre, the patient might have to go into ITU [intensive care] for a night."

"All this has to come out of the tariff. All the hospitals doing this type of operation are feeling the pinch. Some are starting to say, 'We'll either go bust or will have to stop doing revision surgery'. There's a need to make the tariff more realistic."

"The population is getting older, people expect more, the numbers of primaries and revisions are going up. In ten to fifteen years there'll be a lot of fairly seriously elderly and infirm people needing the job done."

And even more femoral heads will need to be collected for bone grafts.

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*Note: The Consultant's and Theatre Sister's names have been changed at their owners' request*