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Spare Parts: The Story of Medicine Through the History of Transplant Surgery

Dr. Russell:
Transplant medicine is entrenched in the practice of medicine, but once upon a time, it was a pipe dream like landing on the moon. Welcome to ReachMD *Book Club*. I'm your host, Dr. John Russell. Today I'm speaking with Dr. Paul Craddock, author of *Spare Parts: The Story of Medicine Through the History of Transplant Surgery*.

Dr. Craddock, welcome to the show.

Dr. Craddock:
Thank you very much for having me, Dr. Russell.

Dr. Russell:
So transplant medicine is not just a product of the 20th Century, correct?

Dr. Craddock:
Absolutely correct. Far from it, actually. The first transplants were skin grafts, and they go back centuries, even millennia. The first written reference is in the *Sushruta Samhita*, so the ancient Ayurvedic Indian surgical texts, and that was a catalog of procedures that were even back then considered traditional, so it's a very old procedure.

Dr. Russell:
So you wrote a lot about people transplanting noses -- skin grafts to rebuild noses. Could you tell us a little bit more about that?

Dr. Craddock:
Absolutely. I suppose I should start by saying that the story in *Spare Parts* begins in the mid-16th Century, and this is when transplant surgery skin grafts had been around for many centuries already, and they evolved to become a secret technique performed, more or less exclusively, by families of Italian peasants, so it was not in any way part of any legitimate or structured medical system. It was part of, I suppose you could say, folk medicine, and it came from horticulture. It's a direct transposition from a horticultural transplant to a human transplant. And the story of modern transplant starts with a renegade Italian surgeon called Leonardo Fioravanti, and he steals that secret from one of these Italian peasant families. He knocks on their door and basically pretends that he's got a relative back home in Bologna, and he had lost his nose fighting in the war in Lombardy, and he'd heard that these surgeons could fix him with a new one using skin from his own forearm. And he asked them if he could watch them perform this procedure just to give him confidence that it would work. He wrote up what he saw, published it, and called it *The Agriculture of the Body and the Farming of Men*.

Dr. Russell:
So transfusion medicine was our next stop on the journey of successful and unsuccessful transplants. Can you tell about that arduous

journey?

Dr. Craddock:
The first reference to a transfusion experiment was in the 1640s, and it was by this man called Frances Potter. He was a churchman and a friend of William Harvey, who your listeners will know about the theory of circulation. Francis Potter was an inventor himself, and he had spent a day with Harvey sharing mechanical insights, and Harvey told him about blood circulation, and he told him that he had been teaching his students all wrong. He had been teaching the old Galenic system where blood is produced in the liver and then consumed as it was needed, and, in fact, blood travels in a circuit powered by a pump, and this inspired Francis Potter to start thinking about how you might connect to mechanical systems.

This kind of evolved through the 1660s into experiments that tried to transplant souls and bits of personality and humors. And the exciting and terrifying thing about transfusion in that period was that circulation was conceived as a way to mechanize what really is not mechanical at all. In other words, you can use the mechanism of circulation to transplant a part of a soul or a quality, so you had situations where surgeons would suggest you might make people younger by transfusing a young calf's blood, for instance, or you might cure a madman by transfusing the pure and calm quality of a lamb. So you have this idea that transfusion could be used to transplant all the mysterious things that belonged to quite other belief systems.

Dr. Russell:
Next up you talk about kind of wild stories about people having their teeth extracted and reimplanted in the mouths of the wealthy. Do you want to expound upon that, Paul?

Dr. Craddock:
Well, that's a very interesting point because it belongs to a completely different society to the blood transfusion experiments. So the 18th Century is the start of the Modern Era, isn't it? It's when we start to get things like shopping, high streets start to spring up, consumerism, industrialization, the beauty industry, and the new philosophical idea of what it means to be an individual. In the 18th Century, you identify yourself with the things you own, what you buy, the friends that you keep, the things you do, and what things are done to you. So you have this sort of modern idea of identity, and all of those changes coincide to create the specialism of dentistry. It's the time when you start to get things like fillings, filing teeth, and cleaning your teeth as well, that becomes important. And transplanting teeth is one of those elements. It was a particularly horrible element because it relied on that industrial culture. It relied on the widening class system, the smaller but more powerful rich classes, who could use a dentist as a middleman to purchase the teeth of poor children.

So the children newly erupted adult teeth, no money to buy sugar so they were pristine, but the elderly rich seemed to have no qualms about replacing their rotten stumps with the teeth of poor children, and it really only fizzled out at the end of the 18th century towards the beginning of the 19th century when some of the recipients started to get syphilis or die of infections, and you had porcelain false teeth coming at the time, as well. They didn't raise so much of a fuss when it was just poor children dying.

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Dr. Russell:
So I think we move into the middle part of the 20th Century, and the field turns towards kidney disease. Do you want to walk us through the story as ultimately ending up in kidney transplants? And a lot were unsuccessful before they were ever successful, correct?

Dr. Craddock:
Absolutely. So many were unsuccessful, and that's because of rejection, or as they called it before the term rejection, “a mysterious biological force.” But the interesting thing is that organ transplants between twins were not rejected.

Dr. Russell:
So the first successful organ transplant were in identical twins, correct? And the surgical team actually took them to a police station to have them fingerprinted and skin grafts made to make sure they were actually twins. That operation was successful but kidney transplants were a complete failure apart from those identical twins.

Now I think as we jump to heart transplants, you certainly can't give a heart to a twin sibling. And it was really a race to be the first person to do a heart transplant. I think Christiaan Barnard is a little bit reminiscent of your old Italian surgeon who kind of stole the technique from the peasant families. Would you tell his story a little bit?

Dr. Craddock:
Absolutely. Christiaan Barnard, he trained in the States, and he was a very good student, so he spent his time observing a lot of different approaches to heart transplants and kidney transplants. And he took those techniques back to South Africa, where he developed a race. And he was adamant that he wanted to be the first. He really only got there because the laws in South Africa would allow you to declare death with just two signatures from two physicians, where the laws in the U.S., and most of the rest of the world, were far more strict so he was able to win that race.

Dr. Russell:
So our story is really filled with a lot of larger-than-life surgeons, but the real history becomes a little pharmaceutical company who had an odd ask of its employees, correct?

Dr. Craddock:
Absolutely. That's Sandoz, and they asked their employees whenever they went on holiday or vacation to bring back soil samples to see if they could identify any new fungi that might be used in drug treatment. And one of these employees brought back a soil sample from his holiday and identified and developed cyclosporin. That was almost a miracle drug because it really did suppress the immune response, and it enabled so many more organ transplants to take place.

Dr. Russell:
Dr. Craddock, it was a great book, and I want to thank you for being on the program and sharing it with us.

Dr. Craddock:
Thank you so much, Dr. Russell.

Dr. Russell:
For more on this series, please visit ReachMD.com/BookClub, and thanks for listening.

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Dr. Craddock, thanks for being on the show today.

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