MEDICAL INNOVATION: TOTAL KNEE REPLACEMENT (MEDICAL DEVICE: THERAPEUTIC)

Physician: Dr. Robert Booth and Dr. John Insall
Industry: Zimmer

Situation

No long-term solutions

Little more than a quarter-century ago, people suffering from arthritis of the knee and other debilitating joint conditions were forced to accept a difficult truth: for the remainder of their lives the best any doctor could do was minimize their pain and make them as comfortable as possible through medication and rest. There were no "long-term" solutions. The lack of available treatment options meant that patients were often robbed of their mobility and presence of mind, diminishing their quality of life.

Beginning in the late 1960's patients began to have another option – knee replacement surgery. However, while the replacement knees available at that time allowed for an improved range of motion for some patients, they were not particularly stable and did not bend well. After surgery, which would leave almost foot-long scars on their legs, patients complained about poor range of motion and increased pain as the devices wore out.

Physicians faced a significant challenge of updating and developing the technology to make it work better for the millions of patients who suffer from debilitating knee conditions each year.

Physician-Industry Collaboration

Teaming with an industry pioneer toward a better design

Dr. Robert Booth, an orthopedic surgeon in Philadelphia, was one of the pioneering doctors who aimed to craft the next generation of artificial knees that would offer a truly workable solution for these patients. He became interested in knee replacement during his internship at Pennsylvania Hospital in the early 1970s, and was particularly captivated by the work of Dr. John Insall, regarded by many to be the father of total knee replacement surgery, who created some of the early prototypes.

Determined to improve patient outcomes following knee replacement surgery, Dr. Booth teamed with his hero, Dr. Insall, to use enhanced designs to create a better prosthetic knee. Dr. Insall had an already established working relationship with Zimmer, Inc., a leading medical device manufacturer, to develop a new type of knee, and Dr. Booth traveled to New York over the next several years to work with Dr. Insall on perfecting the knee's design.

Together with several other physicians and representatives from Zimmer, they performed rigorous clinical tests on a number of prototypes, including testing on cadavers and examining plastic "sawbone" knees to ensure the shape was correct. Zimmer provided the tools to test the resiliency of their new generation knee using unique equipment to see if it was able to bear the strain of typical knee movements, such as walking and running.

Once their next-generation knee was cleared by the FDA in the late 1970s, physicians gradually became informed about it through professional meetings and physician referrals. They

evaluated it, provided their feedback and it eventually became one of the most widely used prosthetic knees worldwide.

Innovation Benefits

Up and walking hours after surgery

Today, building on the work of Dr. Booth and Dr. Insall, new knee replacement technology has transformed the lives of millions of patients. Each year, over 300,000 Americans undergo total knee replacements, with 75% of the patients over the age of 65. And today's knee replacements are personalized to take into account a person's age, weight, activity level and overall health, and the knees are made from different kinds of metal, plastic and ceramic coatings to increase durability and better replicate a patient's natural movements.

What's more, the incisions to insert the joints can now be 2-3 inches instead of the 8-10 inches required only a decade ago, and today patients are often up and walking only hours after surgery and are usually discharged from the hospital in a day or less.

The economic benefits are equally impressive: total knee replacements save an average of $77,000 per patient in lifetime healthcare costs in the U.S., primarily due to the reduced custodial care required by patient, yielding approximately $23.1 billion in lifetime savings annually.

Patient Benefits

"These knees have changed…and extended my life"

As described in AdvaMed's Profiles in Progress You Can See, little did Mike Deaver know at the time of a skiing injury in 1960 that 40 years later it would cause him so much pain that he would be unable to play with his grandchildren or even get out of a cab.

Like millions of others with arthritis, Mike followed a conservative, non-surgical regimen to treat his knees that included cutting back on sports, using heat and ice, and taking anti-inflammatory medication. Yet, despite trying a number of therapies to deal with the pain, including undergoing three arthroscopic surgeries when he served as Deputy Chief of Staff to President Reagan, Mike's knees continued to deteriorate.

The final straw came several years ago when he was getting into a cab and the pain in his knees was so excruciating that he couldn't get out at his destination. It was time to take action, so he had both knees replaced within six months.

Mike is now back to being himself again, working out three days a week and hiking with renewed vigor. He recently proved on a hike in the Sierra Nevada mountains that no challenge is too great – and that includes roughhousing with his grandchildren. He sums up his experience in one sentence: "Quite simply, these knees have changed – and, I believe – extended my life."