HOW THE BONES OF OUR ANCESTORS COULD HELP TREAT MODERN BACK PAIN

The unlikely combination of old human bones and the latest computer modelling techniques are being used to develop new ways of treating chronic back pain. It is the first time old bones have been used in this way.

The research is bringing together the unusual combination of latest computer modelling techniques developed at the University of Leeds and archaeology and anthropology expertise at the University of Bristol. With EPSRC-funding, spines up to a hundred years old from around 40 skeletons housed in museums and university anatomy collections are being analysed in the research.

TAILOR-MADE TREATMENT
The data generated, on different spine conditions and on how spines vary in size and shape, is playing a key role in the development of innovative computer models. This will enable the potential impact of new treatments and implant materials (such as keyhole spinal surgery and artificial disc replacements) to be evaluated before they are used on patients.

The data provided by the old bones will be used to supplement similar data collected from bodies donated to science, which are limited in number and mainly come from older age groups.

“The idea is that a company will be able to come in with a design for a new product and we will simulate how it would work on different spines. The good thing about computer models is that we can use them over and over again, so we can test lots of different products on the same model”, says Dr Ruth Wilcox from the University of Leeds, who is leading the project. "If we were doing this in a laboratory we would need many new donated spines each time we wanted to test a treatment out”.

Ultimately, it will also be possible to use the models to pinpoint the type of treatment best suited to an individual patient.

This is the first software of its kind designed for the treatment of back conditions. The research will also speed up the process of clinical trials for new treatments, which currently can take up to ten years.

COMPUTER MODELLING BREAKTHROUGH
This computer modelling breakthrough is possible thanks to recent advances in micro-CT (computed tomography) scanning and to new techniques developed at the University of Leeds enabling data from micro-CT scans to be transformed into sophisticated computer models. Computed tomography (CT) scans use X-rays to build up 3-dimensional images from multiple cross-sectional pictures of body organs or tissues.
The computer modelling software should be available for testing newly developed products and treatments in the next few years”, says Dr Kate Robson Brown from the University of Bristol’s Archaeology and Anthropology Department, “and along the way this cutting-edge research could even provide new insight into how our ancestors evolved!”

The research community and orthopaedic product manufacturers have only recently started to give spines the same sort of attention that they have traditionally given to hips and knees. This is mainly because getting spinal treatment wrong has much more immediate serious implications for the patient and may even result in legal action against product manufacturers or medical staff.

The new computer models will therefore provide the knowledge and confidence needed to develop and apply new types of treatment which can be tested out first by the computer modelling process.

Moreover, once a range of new back pain treatments have been developed by, for example, product manufacturers, it will also be possible to scan a patient’s back and then use the computer models to identify the optimum treatment option in that particular case.

The project team will carry out a micro-CT scan on vertebrae in each of the spines they analyse, producing highly detailed 3-dimensional images of the vertebrae. The bank of images generated will then be used by the computer models to ‘virtually’ test the effectiveness of a variety of possible back pain treatment options. Those showing clear potential can then progress to the next stage of development.

Engineering, biology, chemistry and computer science will all make a vital contribution to this multidisciplinary project. In addition, close involvement of orthopaedic product manufacturing companies is being sought.

100% increase of reported cases of back pain in England over the past 40 years.

80% of adults will experience at least one episode of back pain at some point in their life.

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