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Association Between Combat-Related Traumatic Injury and Skeletal Health: Bone Mineral Density Loss Is Localized and Correlates With Altered Loading in Amputees: the Armed Services Trauma Rehabilitation Outcome (ADVANCE) Study

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What is the ADVANCE Study?

The ADVANCE Study investigates the physical and psycho-social outcomes of battlefield casualties in the long-term. The study has 1,145 participants who served in the Afghanistan War of 2002-2014. Half of the cohort have sustained serious battlefield injuries, and the other half are the control group of non-injured servicemen. The participants attend 6 study visits over a 20-year period.

What does this piece of ADVANCE research look at?

Many lower limb amputees have low bone mineral density, but the association between combat-related traumatic injury and bone health is uncertain. Having low bone mineral density increases lifetime risk of fracture. This study aimed to test whether combat-related traumatic injury results in lower bone mineral density in the ADVANCE cohort. We also wanted to test whether traumatic lower limb amputees have localised bone mineral density reduction on their amputated side, or whether this reduction was widespread across the skeleton. Comparisons were made between different groups of the cohort, e.g. the injured and uninjured, and those who had experienced a lower limb amputation and the injured non-amputees.



What were the findings?

Bone mineral density of the hip was lower in the injured than the uninjured group. When we split the injured group up, we found that this reduction was significant only at the hip of the amputated limb of amputees. The reduction in bone mineral density was greater for those with an above knee amputation than those with a below knee amputation. There were no differences in bone mineral density of the spine between those with an amputation and the uninjured. Finally, those who suffered an amputation were no less active than those who were uninjured. This is important as lower activity levels are linked to reduced bone mineral density. This shows that the reduction of bone mineral density on the amputated side was not due to reduced activity levels.

What do the findings mean?

Changes in bone health in those with combat-related trauma injury appear to be local to injury rather than widespread and are only evident in those with lower limb amputation. This may arise from altered loading to the joint and muscle, creating a reduced mechanical signal to the hip on the amputated side, resulting in localised reductions in bone mineral density. Interventions to stimulate bone (like certain exercise interventions) may provide an effective management strategy. Some of the ADVANCE researchers have already begun a series of studies to investigate whether certain exercise programmes may be effective at reversing this reduction in localised bone mineral density, aiming to reduce lifetime fracture risk in those who have experienced a lower limb amputation.

Many thanks to the ADVANCE cohort for taking part and to all ADVANCE funders for their generous support.