Bone mineral density

Bone mineral density (BMD) is the amount of bone mineral in bone tissue. The concept is of mass of mineral per volume of bone (relating to density in the physics sense), although clinically it is measured by proxy according to optical density per square centimeter of bone surface upon imaging.

Good bone quality is key in avoiding a multitude of afflictions, including osteoporotic fragility fractures and poor outcomes after spine surgery. In patients undergoing instrumented spine fusion, bone quality often dictates screw pullout strength, insertional torque, and vertebral body loading properties. While dual-energy X-ray absorptiometry (DEXA) screening is the current method of assessing bone mineral density, the majority of patients do not have DEXA measurements available before undergoing surgical instrumentation.

Bone densitometry, also called dual-energy x-ray absorptiometry or DEXA, uses a very small dose of ionizing radiation to produce pictures of the inside of the body (usually the lower spine and hips) to measure bone mineral density.

There is a statistical association between poor bone density and higher probability of fracture. Fractures of the legs and pelvis due to falls are a significant public health problem, especially in elderly women, leading to much medical cost, inability to live independently, and even risk of death. Bone density measurements are used to screen people for osteoporosis risk and to identify those who might benefit from measures to improve bone strength.

Further studies are necessary to identify a relation of BMD and subsidence using optimized implant geometry and by controlling additional intraoperative variables [1].

The vertebral body BMD values are decreased at the adjacent of the posterolateral fusion with transpedicular screw fixation levels in both cephalad and caudad sides at an average of 9-months-follow-up postoperatively. This BMD loss persisted, but not worsened at an average of 32-months-follow-up. Vertebral BMD loss was significantly higher in the L3 vertebra when located caudally versus cranially to the surgery site [2].

1)
Brenke C, Dostal M, Scharf J, Weiß C, Schmieder K, Barth M. Influence of cervical bone mineral density on cage subsidence in patients following stand-alone anterior cervical discectomy and fusion. Eur Spine J. 2015 Dec;24(12):2832-40. doi: 10.1007/s00586-014-3725-9. Epub 2014 Dec 19. PubMed PMID: 25524227.
2)
Balci A, Kalemci O, Kaya FG, Akyoldas G, Yucesoy K, Ozaksoy D. Early and long-term changes in adjacent vertebral body bone mineral density determined by quantitative computed tomography after posterolateral fusion with transpedicular screw fixation. Clin Neurol Neurosurg. 2016 Apr 19;145:84-88. doi: 10.1016/j.clineuro.2016.04.014. [Epub ahead of print] PubMed PMID: 27111840.