Joint Event
11th International Conference on
OSTEOPOROSIS, ARTHRITIS & MUSCULOSKELETAL DISORDERS
&
10th INTERNATIONAL CONFERENCE ON ARTHROPLASTY
December 04-05, 2017 | Madrid, Spain

Circulation based classification of femoral neck fracture - New discoveries of intraosseous blood supply of proximal femur

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Purposes: To explore the characteristics and interconnections of the intraosseous vessel system between different areas of the femoral head and the possible blood supply compensatory mechanism after femoral neck fracture (FNF).

Methods: The 3-D structures of the extra- and intraosseous arteries in 30 uninjured normal human femoral heads were reconstructed and quantified using angiography methods and micro CT scans, AMIRA and MIMICS. We also evaluated the residual blood supply of femoral heads in 27 patients with FNF before surgery by analyzing digital subtraction angiography (DSA) data. The number of affected and unaffected groups of retinacular arteries with different Garden types of fractures were recorded and analyzed to reflect the affected degrees of these three groups of retinacular arteries in patients after FNF.

Results: Epiphyseal arterial network is the most widely distributed and the primary network structure in the femoral head; the main stems of the epiphyseal arteries which were located on the periphery of the intraosseous vascular system have fewer anastomoses than the central region. The DSA of the 27 patients with hip fractures indicated that the inferior retinacular arterial system had a high likelihood of being unaffected after FNF.

Conclusions: The epiphyseal arterial network and inferior retinacular arterial system appear to be two important structures for maintaining the femoral head blood supply after FNF. Increased efforts to protect these key structures during surgery, such as drilling and placing internal implants closer to the central region of the femoral head, might be helpful to reduce the effect of iatrogenic injury of the intraosseous vascular system.

Recent Publications

1. Zhao D, Qiu X and Wang B, et al. (2017) Epiphyseal arterial network and inferior retinacular artery seem critical to femoral head perfusion in adults with femoral neck fractures. Clin Orthop Relat Res. 475(8):2011-2023.
2. Kamada T, Mashima N and Nakashima Y, et al. (2015) Mid-term clinical and radiographic outcomes of porous tantalum modular acetabular components for hip dysplasia. Journal of Arthroplasty 30(4):607-10.
3. Paton RW (2017) Screening in Developmental Dysplasia of the Hip (DDH). Surgeon 15(5):290-296.
4. Clohisy JC (2017) Developmental dysplasia of the hip: contemporary concepts and treatment innovations. Journal of Arthroplasty 32(9S): S18-S19.
5. Tarpada S P, Girdler S J and Morris M T (2017) Developmental dysplasia of the hip: a history of innovation. Journal of Pediatric Orthopaedics. Doi: 10.1097/BPB.0000000000000463.

Biography

Dewei Zhao is a President of Affiliated Zhongshan Hospital of Dalian University, and President of Chinese Association of Microsurgery Surgeons. He dedicates in the treatment of osteonecrosis of femoral head (ONFH) for nearly three decades. Based on anatomical and clinical study, he has made original series surgical techniques for reconstruction of the necrotic femoral head, and these techniques can be applied in every stage of ONFH. He is the editor of nine academic journals. He has published more than 200 papers in basic and clinical research of ONFH, the new finding of circulation of femoral head, new metal biomaterials and their clinical application. His work is especially important for younger patients with symptomatic ONFH.

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