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論文審査の結果の要旨及び担当者

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論文審査の結果の要旨

特発性大腿骨頭壊死症の予後予測や治療法の決定には壊死領域の大きさと局在が重要であり、様々な重症度分類が提唱されているが、どの分類が最も信頼性が高いのかは不明であり、未だ臨床使用においても確立していない。そのため、本研究では、3つの代表分類(壊死部局在分類・壊死部体積分類・壊死部角度分類)を用いて、同一症例群での自然経過を調査している。86関節の平均観察期間9年での調査にて、壊死部局在分類が、骨頭圧潰を予測する上で最も信頼性が高く、加えて壊死部局在分類は他の分類と比較し、簡便に重症度を評価できることから、整形外科医10人での検者内・検者間信頼性の調査においても再現性が高いことが分かった。本研究結果から、壊死部局在分類を用いることで、詳細な圧潰予測が可能となり、臨床使用においては患者に最適な治療法の選択肢を提示できると考えられ、学位に値するものと認める。

論　文　内　容　の　要　旨
Synopsis of Thesis

氏　名 Name	高嶋　和磨
論文題名 Title	Which Classification System Is Most Useful for Classifying Osteonecrosis of the Femoral Head? (特発性大腿骨頭壊死症における最も有用な分類は？)

論文内容の要旨

〔目　的(Purpose)〕

Many studies have confirmed that the size and location of necrotic lesions are major factors that affect the prevalence of collapse and prognosis in patients with osteonecrosis of the femoral head (ONFH). Although several classification systems categorize and quantify ONFH, there is no agreement on which one is most useful for the purpose. We compared the Steinberg, modified Kerboul, and Japanese Investigation Committee (JIC) classifications of ONFH in terms of (1) the correlation among the three different classification systems. We further examined (2) the inter- and intraobserver reliability of the three classification systems and (3) the association of higher grades within each classification and the risk of subsequent collapse.

〔方法ならびに成績(Methods/Results)〕

Between January 2000 and December 2014, we treated 101 hips in 74 patients for precollapse ONFH, diagnosed either on plain radiographs or MRI. Of those, one patient (1%) died, six patients (8%) were lost to followup, and two patients (3%) underwent osteotomy before 2 years, leaving 86 hips in 65 patients (88%) for analysis here. Three-dimensional spoiled gradient-echo sequence (3D-SPGR) MRI was performed for all hips, and the presence of ONFH was determined by finding the area surrounded by the outer margin of the low-signal-intensity band on 3D-SPGR MRI. Patients with ONFH were categorized using the Steinberg, modified Kerboul, and JIC classification systems, and correlations among these three classification systems were investigated. Inter- and intraobserver reliability was assessed by 10 orthopaedic surgeons using 40 sets of 3D-SPGR MR images. The reliability of each system was evaluated using the kappa coefficient. The cumulative survival rate with collapse and undergoing hip arthroplasty as the endpoints was evaluated for each of the three classification systems (mean followup, 9 years; range, 2-16 years), and the association of higher grades within each classification and the risk of subsequent collapse were also evaluated.

We found strong correlations between the Steinberg and modified Kerboul classifications ($\rho = 0.83$, $p < 0.001$), the Steinberg and JIC classifications ($\rho = 0.77$, $p < 0.001$), and the modified Kerboul and JIC classifications ($\rho = 0.80$, $p < 0.001$). Interobserver reliability in the JIC classification (0.72; range, 0.30-0.90) was higher than that in the Steinberg classification (0.56; range, 0.24-0.84; $p < 0.001$) and the modified Kerboul classification (0.57; range, 0.35-0.80; $p < 0.001$). The cumulative survival rate with collapse as the endpoint after a minimum of 2 years of followup in the Steinberg classification differed between Grades A (82%; 95% confidence interval [CI], 66%-97%) and B (43%; 95% CI, 21.9%-64.8%; $p = 0.007$), Grades A and C (20%; 95% CI, 4.3%-35.7%; $p < 0.001$), and Grades B and C ($p = 0.029$). Survival was lower for modified Kerboul Grade 4 hips (12%; 95% CI, 0%-27.1%) than for Steinberg Grade C hips (20%; 95% CI, 4.3%-35.7%) and JIC Type C2 hips (18%; 95% CI, 2.8%-34.0%). The JIC classification was best able to identify hips at low risk of collapse because no JIC Type A hips collapsed.

〔総　括(Conclusion)〕

The JIC classification was more reliable and effective, at least for early-stage ONFH, than the Steinberg or modified Kerboul classifications. Further investigation might be useful to identify whether each classification system emphasizes specific risk factors for collapse.