Fiksasi interna sekrup iliosakral pada S1-S3 dan sekrup pubis sebagai konfigurasi terbaik untuk fraktur pelvis tidak stabil dengan fraktur vertikal sakrum unilateral (AO tipe C1.3) suatu (studi biomekanik) = Internal fixation of S1-S3 iliosacral screws and pubic screw as the best configuration for unstable pelvic fracture with unilateral vertical sacral fracture ao type C1.3 biomechanical study / Oryza Satria

Oryza Satria, author

Abstrak

[ABSTRAK
Pada fraktur pelvis tidak stabil yang disertai dengan fraktur vertikal sakrum (AO Tipe C1.3) terdapat instabilitas terhadap gaya shearing aksial yang besar. Fiksasi pada fraktur tersebut harus memberikan kekuatan biomekanik yang baik dan minimal invasif. Penempatan sekrup iliosakral (SIS) di S1-S3 secara divergen dapat meningkatkan kekuatan biomekanik terutama kekakuan translasi. Tujuan penelitian ini adalah mengevaluasi kekuatan biomekanik SIS S1-S3 dan sekrup pubis (PS) dibandingkan konfigurasi fiksasi lain untuk memberikan solusi konfigurasi fiksasi baru pada fraktur pelvis AO Tipe C1.3.
Simulasi fraktur pelvis dibuat dengan fraktur ramus pubis superior, inferior, dan fraktur vertikal sakrum ipsilateral (AO tipe C1.3) pada tulang sintetik Synbone®. Enam kombinasi fikasi yaitu Tension Band Plate (TBP)+PS, TBP+plat symphysis (SP), SIS S1-S2+PS, SIS S1-S2+SP, SIS S1-S3+PS, SIS S1-S3+SP diuji dengan diberikan beban aksial menggunakan mesin kompresi Tensilon® sampai titik kegagalan fiksasi sebesar ≥2 mm atau ≥20, kemudian dievaluasi kekakuan translasi, kekakuan rotasi, dan titik kegagalan fiksasi. Analisis statistik dilakukan dengan uji ANOVA dilanjutkan dengan uji post-hoc Bonferroni
Dari hasil uji biomekanik didapatkan kelompok fiksasi SIS S1-S3+PS memiliki kekakuan translasi, kekakuan rotasi, dan titik kegagalan fiksasi tertinggi (830,36 N/mm, 599,68 N/°, dan 1522,20 N) terhadap beban aksial.
Fiksasi SIS di S1-S3 dan sekrup pubis merupakan fiksasi terbaik untuk fraktur pelvis tidak stabil dengan fraktur vertikal sakrum karena mempunyai properti biomekanik yang baik dan secara klinis fiksasi ini memberikan keuntungan prosedur yang minimal invasif dan pasien dapat mobilisasi segera sehingga mengurangi komplikasi postoperatif.
<hr>
ABSTRACT
In unstable pelvic fracture with vertical sacral fracture (AO Type C1.3), there are tremendous instability towards axial shearing load. Ideally, the fixation should provide good biomechanical properties and minimal invasive. Divergent Iliosacral screw (ISS) placement on S1-S3 could enhance biomechanical strength. The purpose of this research was to evaluate the biomechanical properties of ISS S1-S3 and pubic screw (PS) compared to other configuration to provide solution for new configuration of fixation in AO Type C1.3 pelvic fracture.
A simulation of pelvic fracture was created on superior and inferior pubic rami, and ipsilateral vertical sacral fracture (AO Type C1.3) on a synthetic bone (Synbone®). Six fixation combination including tension band

plate (TBP)+PS, TBP+symphyseal plate (SP), ISS S1-S2+PS, ISS S1-S2+SP, ISS S1-S3+PS, ISS S1-S3+SP were tested using compression machine Tensilon® until failure point defined by ≥2 mm or ≥20 displacement was met. Translational stiffness, rotational stiffness and load to failure were evaluated. Statistical analysis was performed with ANOVA test followed by Bonferroni post hoc-test.
From biomechanical test, fixation using ISS S1-S3+PS had the highest translational stiffness, rotational stiffness, and load to failure (830,36 N/mm, 599,68 N/°, and 1522,20 N respectively) toward axial load.
Fixation by ISS S1-S3+PS was the best configuration in unstable pelvic fracture with vertical sacral fracture due to its good biomechanical strength, minimal invasiveness which renders early immobilization for patients hence decreasing postoperative complications., In unstable pelvic fracture with vertical sacral fracture (AO Type C1.3), there are tremendous instability towards axial shearing load. Ideally, the fixation should provide good biomechanical properties and minimal invasive. Divergent Iliosacral screw (ISS) placement on S1-S3 could enhance biomechanical strength. The purpose of this research was to evaluate the biomechanical properties of ISS S1-S3 and pubic screw (PS) compared to other configuration to provide solution for new configuration of fixation in AO Type C1.3 pelvic fracture.
A simulation of pelvic fracture was created on superior and inferior pubic rami, and ipsilateral vertical sacral fracture (AO Type C1.3) on a synthetic bone (Synbone®). Six fixation combination including tension band plate (TBP)+PS, TBP+symphyseal plate (SP), ISS S1-S2+PS, ISS S1-S2+SP, ISS S1-S3+PS, ISS S1-S3+SP were tested using compression machine Tensilon® until failure point defined by ≥2 mm or ≥20 displacement was met. Translational stiffness, rotational stiffness and load to failure were evaluated. Statistical analysis was performed with ANOVA test followed by Bonferroni post hoc-test.
From biomechanical test, fixation using ISS S1-S3+PS had the highest translational stiffness, rotational stiffness, and load to failure (830,36 N/mm, 599,68 N/°, and 1522,20 N respectively) toward axial load.
Fixation by ISS S1-S3+PS was the best configuration in unstable pelvic fracture with vertical sacral fracture due to its good biomechanical strength, minimal invasiveness which renders early immobilization for patients hence decreasing postoperative complications.]