Prophylactic Usage of Interspinous Spacer in Rigid Lumbar Fusion Surgery, Does it Work for Prevention of Adjacent Level Disc Degeneration?
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Introduction: Posterior spinal instrumentation is used extensively in the treatment of spinal disorders, such as fractures, disc disorders, and scoliosis correction, etc. Complications and problems of fusion surgery, e.g., the adjacent segment disease (ASD), have been frequently reported. Abnormal loading and increased mobility in the adjacent segments may be the causes of ASD. Recently, the interspinous spacer was developed to constrain the excessive motion of motion segment. The purpose of this study is to check if the interspinous spacer can biomechanically reduce the motion and intradiscal pressure of adjacent level to prevent the ASD following spinal fusion.

Methods: Four 4-level lumbar motion segments were dissected from 6-month-old pigs. All soft tissues except the surrounding ligaments and facet capsule were carefully removed. Specimens were wrapped in saline-soaked gauze and stored in the freezer until the experiment. Four pedicle screws, with 6 mm in diameter and 40 mm in length, were inserted into two segments of lumbar vertebra. Coflex-“interspinous U” with 8 mm in width was used in cranial adjacent interspinous space of instrumentation level. Four groups of experimental setup were examined. The four groups are: Group A: intact vertebra as control group; Group B: injury group with bilateral facetectomy and excision of interspinous ligament over intended instrumentation level, Group C: the fusion group, instrumentation group with four pedicle screws insertion for Group B, Group D: fusion group C with Coflex insertion over cranial adjacent interspinous space. A needle pressure sensor was prepared for measuring intradiscal pressure under meticulous investigation. Two pressure sensors were inserted into the center of the cranial adjacent disc and implant level disc. Range of motion (ROM) and intradiscal pressure were recorded by CCD image and pressure transducer. Both flexion and extension of intact and post-instrumentation spinal column were recorded only in this study. Intradiscal pressures of instrumentation and cranial adjacent level were recorded.

Results: In extension test, the IDP of cranial adjacent level of Group C was 1.4(0.7) bar, and the IDP of cranial adjacent level of Group D was 1.4(1.6) bar. In flexion test, the IDP of cranial adjacent level of Group C was 6.2(2.1) bar, and the IDP of cranial adjacent level of Group D was 5.6(2.3) bar. The IDP of cranial adjacent level of Group C is not different from the one of group D. However, the ROM restriction was noted after Coflex insertion, especially in extension test (3.5(1.6) degree vs. 1.4(0.7) degree).

Discussion: In our preliminary study, the intradiscal pressure of cranial adjacent disc level has no significant change before and after inserting Coflex under rigid instrumentation. The current results show that the prophylactic usage of Coflex in prevention of adjacent level disease may not be effective. Some limitations about this study should be addressed. This study use porcine lumber instead of the human cadaver. The porcine lumber is usually stronger than the degenerated human one. Hence, the degree of deformation may be smaller than the one of human cadaver. In conclusion, the prophylactic implantation of interspinous device may help the hyper extension of adjacent level, but cannot reduce the IDP of the constrained level.

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