INTRODUCTION:
Efforts were made to avoid complications after lumbar discectomy, such as progressive degeneration of the spinal segment and disc reherniation. These complications may be attributed to the compromised state of the annulus fibrosus during surgery. Perioperative suturing of the annular defect is the most straightforward solution to deal with damaged annulus fibrosus. The resistance ability of the intervertebral disc after discectomy could be enhanced and progression of disc degeneration could be postponed by our unique annular closure method (presented in 55th ORS annual meeting). However, larger annular defects were difficult to seal directly by the suturing methods. This study presents the biomechanical properties of the intervertebral disc, utilizing an annular graft with different suturing repair methods following lumbar discectomy.

MATERIALS AND METHODS:
A total of 36 functional lumbar spinal units were harvested from 6-month-old pigs and tested in this study. All methods and procedures were peer reviewed and approved by the animal care committee of Taipei City Hospital. The pre-cut annular grafts were carefully harvested from additional porcine discs and processed to reduce 50% of total content by shrinking and rehydration. The full-thickness annular defect (4mm length, 3mm width) was performed in anterolateral aspect of intervertebral disc of the motion segment. Annular grafts were filled into the annular defect and closed by 3 different methods. The purposes of these sutures were to contract the annular defect and to fix the annular grafts. These methods include simple suture, cross suture and our unique suturing method (the modified purse-string suture, MPSS) (Figure 1). The intrinsic failure strength of the discs was measured by a simple mode of internal hydrostatic pressure. Using an Instron 4400 servohydraulic testing system (Instron, Norwood, MA), colored algin was injected under monitored pressure into the nucleus through a stainless steel conduct tube insert, which passes through one of the attached vertebrae. The pressure of the initial leakage of injected algin from the suture sites was recorded.

RESULTS:
The failure of the repaired motion segment was associated with a sudden leakage of colored algin in the suture sites and a sudden pressure drop. The mean failure pressure of motion segments after simple suturing was 0.43±0.09 MPa, cross suturing 0.47±0.07 MPa and MPSS 0.99±0.23 MPa. There were significant differences between MPSS and simple/cross suturing methods. The motion segments repaired by annular grafting and simple suturing failed at a pressure of 0.96±0.13 MPa, annular grafting and cross suturing failed at 1.09±0.12 MPa and by annular grafting combined with MPSS at 1.88±0.3MPa. The combination (suture with grafting) provided stronger resistance than suturing alone and the difference was significant (Figure 2).

DISCUSSION:
Our findings suggest that combination of annular grafting with suturing methods can provide significant sealing effect to larger annulus defect. We believed that this was the key factor to increase the resistance ability of the disc undergoing load and to stabilize intervertebral disc pressure after discectomy. By using this technique, the possibility of reherniation and consequent degenerative processes within the nucleus after discectomy can be avoided and slowed down.

REFERENCES: