Introduction
Since a report by Insall et al. 1,2), obtaining proper soft tissue balance has been recognized as one of the most important techniques in successful total knee arthroplasty (TKA). However, it is practically difficult to obtain a perfect soft tissue balance during surgery 3). The final goal of achieving good balance in TKA should have a good balance in TKA in the postoperative periods, not necessarily during the surgery itself. To understand what is an appropriate balance during the surgery, it is important to elucidate the relationships between the the various postoperative periods including immediately after the surgery as they regard the balance.

Materials and Methods
The study comprised 80 consecutive primary TKA in 64 patients between July 2003 and Dec 2004. Of these, 38 cases (46 knees) presented with osteoarthritis and 26 cases (34 knees) with rheumatoid arthritis, with ages ranging from 32 to 84 years (mean, 66 years). The knees on which TKA was performed were classified into three groups according to their preoperative knee alignments as determined from standing antero-posterior (A-P) radiographs: valgus alignment type (Group-VL), normal alignment type (Group-N) with femorotibial angle (FTA) of 169-179°, and varus alignment type (Group-VR) with FTA ≦180°. Varus alignment type was most common; the numbers of group-VL, group-N, and group-VR knees were 11(RA11 /OA0), 19(RA16/ OA 3), and 50(RA11/OA39), respectively. Prostheses used in this study were Natural Knee® (Zimmer, Inc, Warsaw, IN) in 52 knees and Scorpio NRG® (Stryker Howmedica Osteonics, Allendale, NJ) in 28 knees. Both prostheses are of posterior-stabilized design. Postoperative coronal laxity was assessed by stress radiographs of the knees using the Telos SE® arthrometer (Fa Telos; Medizinisch-Technische, Greisheim, Germany). Antero-posterior radiographs were taken using the Telos arthrometer under the conditions of valgus and varus stresses of 7kg applied to the knee in 15° of flexion. From the stress radiograph a measurement of the angle between the line in contact with the upper surface of the tibial prosthesis was defined as the “valgus angle,” valgus stress radiographs the laxity angles were also measured, and we defined the value of the laxity angle in varus stress as the “varus angle”. From the angle three months after surgery significantly decreased to as small as 4.2±2.3°. No significant difference was observed between VR knees, and NA knees, no significant difference was observed both varus angle and valgus angle for the laxity angle between immediately after the surgery and other postoperative periods. In VR knees, the varus angle immediately after surgery was large in VR knees; however, if adequate valgus alignment was maintained at the surgery, the laxity would decrease at normal level at three months after the surgery.

RESULTS
Laxity angles were evaluated in each deformity types (Fig 1, 2, 3). In VL knees and NA knees, no significant difference was observed both varus angle and valgus angle for the laxity angle between immediately after the surgery and other postoperative periods. In VR knees, the varus angle immediately after surgery was as large as 6.6±3.5°. However, the angle three months after surgery significantly decreased to as small as 4.2±2.3°. (Fig 3). No significant difference was observed between OA and RA in group-VR at every postoperative period (Fig 4).

DISCUSSION
Ishi et al. 9) reported that the mean values for valgus and varus angles were 4.8° and 4.5° with PCL-retaining prostheses and 4.6° and 4.0° with posterior-stabilized prostheses. Both the varus and valgus angles in our reports were 4.1°, and this value was similar to values in previous reports. In this report, we included patients with two different diseases; osteoarthritis and rheumatoid arthritis.

In VR knees, medial soft tissue including the medial collateral ligament are generally shortened, while lateral soft tissue is generally lax and stretched preoperatively. There are two strategies for the adjustment of the soft tissue balance in these VR knees: one is that medial and lateral gaps should be always equal even with varus-deformed knees 10), another is that same degree of lateral side laxity should be allowed as long as proper valgus alignment is maintained. In the latter theory, there is a possibility of residual varus instability after the operation. In this study we used the latter strategy to treat varus-deformed knees. The result of our study revealed that varus instability immediately after surgery was largely due to residual lateral laxity in group-VR; however it ameliorated at 3 months after surgery. Yamamoto et al. 10) reported that shortening of the patella tendon in rabbits was observed 2 weeks after the removal of the tension on the tendon. In cases of TKA with VR knees, a similar shortening of the soft tissue on the lateral side might occur due to the loss of tension by postoperative changes in the alignment.

CONCLUSION
Varus angle (laxity) immediately after TKA was large in VR knees; however, if adequate valgus alignment was maintained at the surgery, the laxity would decrease at normal level at three months after the surgery.

REFERENCES