

Brief Communication

Comparison of Total Hip and Knee Component Weights

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Abstract: Weights of total hip and total knee components from 4 major orthopaedic device manufacturers are compared. These data provide surgeons with information that is not readily available and may serve as a reference for patient information or possibly biomechanical studies in the future. **Key words:** hip, knee, arthroplasty, prosthetic components, biomechanics.

The changes in total hip and knee component design and materials have been complex and varied since the 1980s. One aspect not reported in the design, manufacturing, and sales of these arthroplasty components is their weight and any difference in weight compared with the bone that is resected. It has also been noted over the past several years by the senior author (K.A.K.) that many patients ask what their new joint arthroplasty will weigh. To date, no previous publication has discussed this question; as well, no information on the component packaging or product insert is available.

This study surveyed 4 major orthopaedic device manufacturers for comparison of total hip and knee component weights. Seven different total hip systems and 5 different total knee systems were used for statistics and compared with the weight of bone resected in primary total hip and knee surgery. These data provide surgeons with information that

is not readily available and may be of general interest to them and their patients. In addition, this is information that can be considered in future biomechanical studies.

Four major orthopaedic total joint manufacturers were surveyed (Howmedica, Rutherford, NJ; DePuy, Warsaw, IN; Zimmer, Warsaw, IN; Joint Medical Products, Johnson & Johnson, Raynham, MA). They freely submitted the weights of medium-sized components of 7 different total hip systems and 5 different total knee systems. The data were sorted by individual components as well as total weight of all components needed in total hip (femoral stem acetabular shell and insert and femoral head) and total knee (femoral and tibial component, tibial tray, and patellar backing) implantations. The data were separated for the hip systems by alloy used for the femoral stem (cobalt-chrome vs titanium) also, and all total knee systems were grouped for comparison of bone weight resected.

The weight of the bone resected for 20 total hip and 20 total knee arthroplasties was determined in the operating room using a triple-beam balance. For total hip patients, the femoral head and calcar were weighed in the operating room after the neck/calcar cut was made. The acetabular and femoral canal

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Table 1. Total Knee Component Weights

Company	Femoral Component	Tibial Component	Tibial Insert	Patellar Dome	Total Weight
Joint Medical Products*	373.6 g	113.6 g	NA	5.7 g	492.8 g
Depuy†	150.5 g	93.7 g	28.4 g	27 g	299.6 g
Howmedica‡	223 g	96.2 g	30 g	16.5 g	365.7 g
Zimmer† MG II	255.7 g	56.8 g	42.6 g	14.2 g	369.3 g
IBS	298.2 g	142 g	42.6 g	14.2 g	497.0 g
Total	260.2 ± 74.5 g	100.5 ± 27.8 g	35.5 ± 7.1 g	15.8 ± 7.3 g	404.9 ± 77.6 g

*Johnson and Johnson, Raynham, MA.

†Warsaw, IN.

‡Rutherford, NJ.

reamings were not included. For total knee patients, the femoral, tibial, and patellar cuts were all weighed separately and averaged as groups as well as totaled for complete weight resected. Weight of soft tissues resected from the knee was not included in the study.

All of the average total knee component weights and their standard deviations are listed in Table 1. The femoral components for total knees ranged from 150.5 to 373.5 g, with an average of 260.2 ± 74.5 g. The tibial components ranged from 56.8 to 142 g, with an average of 100.5 ± 27.8 g. The tibial inserts ranged from 14.2 to 42.6 g, with an average of 28.5 ± 10.1 g, and the patellar dome ranged from 5.7 to 28.4 g, with an average of 21.5 ± 12.8 g. The average weight of a combined total knee system was 404.9 ± 77.6 g.

The total hip arthroplasty component weights are listed in Table 2. The average titanium femoral stem weighed 166.9 ± 14.9 g, and cobalt–chrome stem, 318.1 ± 72.1 g. The average titanium stem system (including acetabular components) weighed $369.9 \pm$

33.3 g, and the cobalt–chrome system weighed 487.5 ± 59.6 g. When combined, the average overall system weighed 453.9 ± 75.3 g.

Fairly small standard deviations resulted for each set of resected bone weighed in the operating room. For total knees, the average weight of bone was 104.5 ± 14.5 g, and for total hips, 114.5 ± 16.5 g. Both of these weights are roughly one fourth that of the combined weight of the arthroplasty components used.

This study surveyed 4 of the major orthopaedic total joint manufacturers to compare weights of replaced joints versus bone resected. The results show that there is an approximate threefold increase in weight with a replaced hip or knee arthroplasty compared with the bone resected. Although 0.3 kg (0.66 lb.) is 2 orders of magnitude less than the approximate weight of the lower extremity, its overall effect will move the center of gravity distally for a total knee arthroplasty and slightly proximally for a total hip arthroplasty. In theory, this should increase the forces necessary to move the hip after a

Table 2. Total Hip Component Weights

Company	Femoral Head	Femoral Stem	Acetabular Lining	Acetabular Shell	Total
Joint Medical Products* (Ti)	73.8 g	181.8 g	19.9 g	127.8 g	403.3 g
Depuy†	71 g	403.3 g	25.6 g	65.3 g	499.8 g
Zimmer† (Ti)	85.2 g	152.0 g	28.4 g	71.0 g	336.6 g
Zimmer	85.2 g	213.0 g	28.4 g	71.0 g	397.6 g
Howmedica‡ Reliance	42.6 g	332.3 g	11.0 g	135.0 g	520.9 g
Premier	42.6 g	260.0 g	11.0 g	135.0 g	448.6 g
Meridian	42.6 g	382.0 g	11.0 g	135.0 g	570.6 g
Total	63.3 ± 18.6 g	274.9 ± 91.9 g	19.3 ± 7.7 g	105.7 ± 31.8 g	453.9 ± 75.3 g

*Johnson and Johnson, Raynham, MA.

†Warsaw, IN.

‡Rutherford, NJ.

Ti, titanium.

total knee arthroplasty, as moving the center of gravity distally should increase the moment arm from the hip joint. After a total hip arthroplasty the weight of the lower extremity is increased by the weight of the femoral stem and head. The center of gravity will in theory move cephalad, diminishing the effects of the increased weight.

This study provides a general informational message. The information is not readily available to clinicians or researchers. It serves as a reference for

patient information or possibly biomechanical studies in the future.

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