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Analysis of total knee replacements in a South Indian Institute

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ABSTRACT

Background: Total knee replacement (TKR) is the most widely practised elective surgical procedure for advanced osteoarthritic patients globally. There is paucity of data on TKR's in south Indian population. This study was aimed at analysing the peri-operative data of primary TKR's to ease in customising the imported implants for our population.
Methods: Data on 261 TKR's performed in our institute over 40 months was collected. Categorical variables like age, gender, size of components used, co-morbidities and type of implants used were analysed.
Results: Out of 220 patients with 261 knees, 141 were females (173 knees) and 79 were males (88 knees). The age group of the cohort was 60±11.2 years (Mean±SD). Diabetes and Hypertension (n=152) were the commonest co morbidities. The Cruciate Retaining (CR) type of prosthesis was used to the maximum extent (n=218). Size 3 femoral and tibial component was the commonly used in males and size 2 in females. 143(54.8%) knees had tibio-femoral component mismatch.
Conclusions: This study gives a reasonable insight into various aspects of the total knee replacements in a South Indian Institute. This data would be useful for manufacturing suitable implants customised for our population in the context of imported implants being in vogue. It also helps the operating surgeon to appropriately order for the desirable implants well in advance lest he should struggle intra operatively for want of better clinical outcome.

Keywords: Osteoarthritis, Total knee replacement, Diabetes mellitus, Hypertension, Component size mismatch

INTRODUCTION

Osteoarthritis of knee is a predominant cause of long term disability.[1] Permanent damage to the articulating architecture of the knee ultimately warrants replacement of the worn out surface. Total knee replacement (TKR) is the last and efficacious option for consideration, for pain and disability arising out of an arthritic knee. Advanced osteoarthritis is the commonest indication for total knee replacement.[2-4] Over the last two to three decades there has been a drastic increase in the utilisation rates of total knee replacements all over the world.[5-7] There is paucity of data on total knee replacements in south Indian population.[8] As we don't have established registries akin to the developed countries, an attempt was made to put forth the available data regarding total knee replacements from a cohort of patients to bridge the gap in epidemiological statistics. Hence this study was aimed at analysing the peri-operative data of primary total knee replacements done on patients with significant disability arising out of a painful and advanced osteoarthritic knee. Special focus has been rendered to know the average age at which the patients underwent knee replacement, gender predilection, sizes of the prosthesis used and component mismatch and effect of co-morbidities like diabetes, hypertension in the study cohort. As imported implants are in vogue, the outcome of this study would be useful to customise the prosthesis for our population.

METHODS

Data pertaining to the 261 total knee replacement surgeries performed in our institute from April 2012 to July 2015 (40 months) was collected from the department of medical records manually. All the cases of primary total knee replacement done for advanced osteoarthritis were included in the study without any exclusion. The study group was divided into eight categories based on the 2 most common co-morbidities (i.e. diabetes and hypertension) (Table 1).

Table 1: Categorization of the cohort.

Group I	Male (n=79)
Ia	Only DM
Ib	Only HTN
Ic	DM & HTN
Id	None
Group II	**Female (n=141)**
IIa	Only DM
IIb	Only HTN
IIc	DM & HTN
IId	None

All the surgeries were performed by a single surgeon using the instrumentation and prosthesis supplied by a single company (Depuy-Johnson and Johnson) with uniform selection criteria for all the patients (i.e. disability owing to painful knee from an advanced osteoarthritis) was considered. All the patients were admitted well in advance before the elective surgery. Pre-anaesthetic check-up was performed in all the cases with due recording of all the vital data. Random blood glucose (RBS) was done on the day of admission. Blood pressure recordings were taken from the pre-anaesthetic chart. Relevant cross consultations were taken up at the advice of the consultant anaesthetist. Uniform and standard instructions were adopted for all the cases posted for surgery with additional inclusions specifically required for a given case preoperatively. All the cases were put on a long knee immobiliser immediately after the surgery which continued till the suture removal on 11th post-operative day. All the cases received epidural analgesia/ patient controlled analgesia on the day of surgery and subcutaneous low molecular weight heparin after 8 hours of the surgery which was continued for 5 days. Postoperative radiographs were taken on day 2 after the removal of suction drain. Physiotherapy was started on day 2 after the radiographic confirmation with touchdown weight bearing and range of motion exercises as permissible and tolerated by the patient under the direct supervision of in house physiotherapist. Categorical variables like age, gender, size of components used, co-morbidities and type of implants used were analysed.

Statistical analysis

Statistical analysis of data was performed using the Graph Pad Prism-Version7, Med-Calc version 17.9.7, excel for Windows 7 software. Chi square test was done for analysis of categorical variables. P>0.05 was considered insignificant, p<0.05 was considered significant and p<0.001 was considered highly significant.

RESULTS

A retrospective cohort study was done on 220 patients with 261 total knee replacements. Out of the 220 patients 141 were females (173 knees) and 79 were males (88 knees). Gender predilection was significant with p<0.0001 indicating the female predominance. The age group of the cohort was 60±11.2 years (Mean±SD). Average age was 59.9±12.1 in males, 60.1±10.7 in females and there was no significant difference in the age group between males and females (p>0.05) (Figure 1).

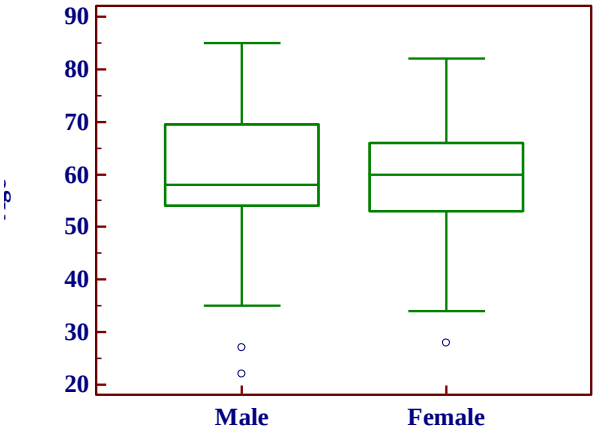

Figure 1: Figure depicting the age and gender distribution in the TKR cohort.

No significant difference was found with regard to random blood glucose, blood pressure and perception of pain till the date of admission (Table 2).

The number of patients undergoing TKR with co-morbidities i.e. either diabetes or hypertension (n=152) in comparison to patients without diabetes or hypertension (n=68) was found to be significant (p=0.0001). On detailed evaluation it was found that out of 220 patients, 141 patients were hypertensives (p=0.0001) and the proportion of patients having hypertension alone was maximum (n=82, 37.27%, p=0.0006).

Side predilection between left and right was not significant (Table 3).

The cruciate retaining (CR) type of implant/prosthesis was used to the maximum extent (n=218, p<0.0001) (Table 4).

Statistically significant number of male knees (n=40) had size 3 femoral component (p<0.0001) and female knees (n=83) had size 2 (p<0.0001) (Figure 2).

Table 2: Demographic variables.

Study group		Age	RBS (mg/dl)	SBP (mm hg)	DBP (mm hg)	Pain since (y)
		60±11.2	108.5±29.3	123.8±12.6	79.9±8.9	5.4±4.5
Group I	Male (n=79)	59.9±12.1	110.5±33.9	124±13.3	79.8±9.2	4.3±3.7
Ia	Only DM (n=4)	58.7±9.5	146±46.7	132.5±9.6	80±8.2	1.5±1.0
Ib	Only HTN (n=25)	63.7±9.7	98.2±10.0	125.0±11.4	80.7±8.7	5.1±3.4
Ic	DM &HTN (n=23)	61.4±9.4	124.5±50.0	126.8±10.3	83.2±10.3	4.2±3.8
Id	None (n=27)	55.1±15.1	106.3±23.5	119.3±23.5	75.9±9.8	3.8±3.9
Group II	Female (n=141)	60.1±10.7	107.5±26.7	123.6±12.2	79.9±8.8	5.9±4.7
IIa	Only DM (n=7)	35.4±34.9	121.9±3.6.3	123.3±8.7	80.0±5.0	5.3±0.8
IIb	Only HTN (n=57)	60.8±10.5	104.4±20.5	122.9±12.5	79.4±8.9	5.3±10.4
IIc	DM &HTN (n=36)	63.2±9.0	120.1±35.7	127.8±13.6	83.1±10.0	5.5±4.4
IId	None (n=41)	58.3±11.4	98.2±16.5	121.1±10.4	77.78±7.4	5.2±4.4

Note: RBS- Random blood glucose, mg/dl –milligrams per decilitre, SBP- Systolic blood pressure, mm/hg- millimetre of mercury, DBP- Diastolic blood pressure, DM- Diabetes mellitus, HTN- Hypertension, Y- Years.

Table 3: Side predilection.

	Left	Right	Both knees
Male (n=79)	41	29	9
Female (n=141)	53	56	32
Total (n=220)	94	85	41

Table 4: Type of implant used.

	CR	PS	TC3
Male (n=79)	75	9	4
Female (n=141)	143	28	2
Total	218	37	6

Note: CR: Cruciate retaining, PS/CS: Cruciate substituting, TC3: Three component knee prosthesis.

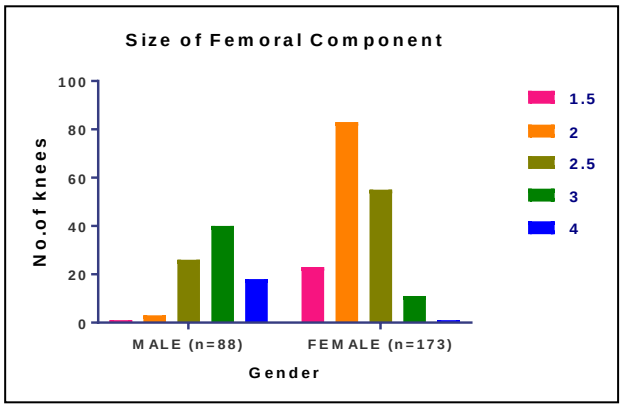

Figure 2: Figure depicting the size of femoral component used in the study group.

Statistically significant number of male knees (n=39) had size 3 tibial component (p<0.0001) and female knees (n=79) had size 2 (p<0.0001) (Figure 3).

Out of 261 knees operated 143(54.8%) knees had tibio-femoral component size mismatch which was significant (p<0.001) (Table 5).

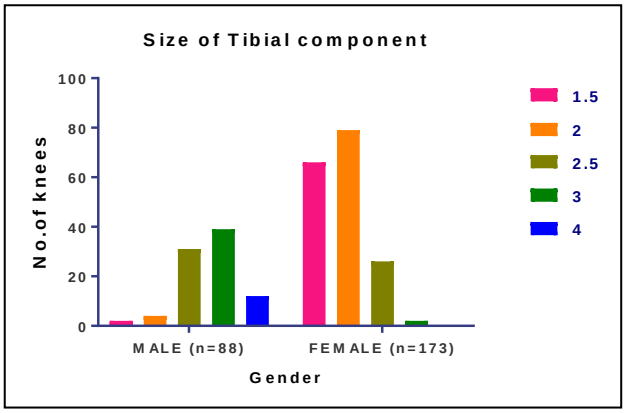

Figure 3: Figure depicting the size of tibial component used in the cohort.

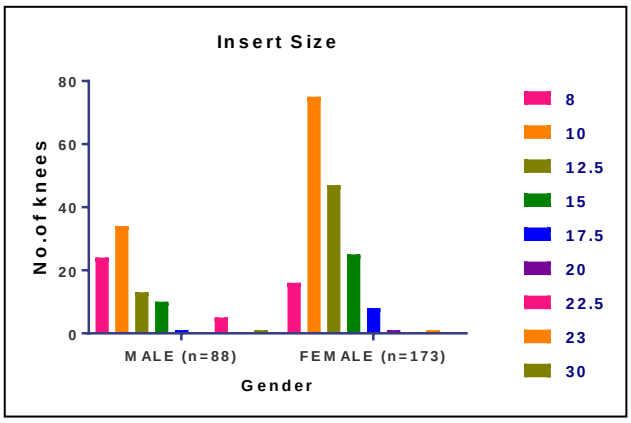

Figure 4: Figure depicting the size of insert used in the study group.

Out of the 261 operated knees 149 knees had fixed bearing curved plus (FBCP) insert (p<0.0001) (Table 6).

Out of the 261 operated knees 109 knees had size 10 insert (p<0.0001) followed by 12.5 (n=60) (Figure 4).

Table 5: Mismatch analysis between femoral and tibial components.

Component	n=261	(%)
Femur > Tibia	124	47.5
Femur < Tibia	19	7.3
Femur = Tibia	118	45.2

Table 6: Type of insert.

	FBS	FBC	FBCP	TC3	CLCI	CLSI	RP3	P value
Male (n=79)	7	21	46	3	10	0	1	<0.0001
Female (n=141)	26	36	103	2	4	2	0	<0.0001
Total	33	57	149	5	14	2	1	<0.0001

FBS: Fixed Bearing Stabilized, FBC: Fixed Bearing Curved, FBCP: Fixed Bearing Curved Plus, TC3: Three Component Knee Prosthesis, CLCI: Cross Linked Curved Insert, CLSI: Cross Linked Stabilized Insert RP3: Rotating Platform of TC3.

Table 7: Size of femoral component.

	1.5	2	2.5	3	4	P value
Male knees (n=88)	1	3	26	40	18	<0.0001
DM	1	0	1	1	2	0.896
HTN	0	0	5	19	5	0.0012
Both	0	1	8	9	7	0.1023
None	1	2	12	11	4	0.0014
Female knees (n=173)	23	83	55	11	1	<0.0001
DM	1	4	3	1	0	0.392
HTN	6	29	25	2	1	<0.0001
Both	9	23	11	3	0	0.0004
None	7	27	16	5	0	0.0001
Total (n=261)	24	86	81	51	19	<0.0001

Table 8: Size of tibial component.

	1.5	2	2.5	3	4	P value
Male knees (n=88)	2	4	31	39	12	<0.0001
DM	0	0	1	3	0	0.6171
HTN	0	1	10	12	6	0.0207
Both	0	2	10	10	3	0.0282
None	2	1	10	13	3	0.0005
Female knees (n=173)	66	79	26	2	0	<0.0001
DM	3	5	1	0	0	0.2636
HTN	23	26	13	1	0	<0.0001
Both	20	22	4	0	0	0.0018
None	20	26	8	1	0	<0.0001
Total (n=261)	68	83	57	41	12	<0.0001

The average hospital stay was 11 days per operated knee with no significant evidence of deep vein thrombosis or pulmonary thromboembolism. There were no per-operative or immediate postoperative mortalities. There were no cases of deep seated infections requiring revision.

DISCUSSION

This retrospective South Indian study gathered all the perioperative information pertaining to primary TKR done on advanced osteoarthritic patients over a period of 40 months. It was noted that the average age group was 60±11.2 with no significant gender variation. This was in concordance with the other studies globally.[5,9] In our study female predominance in TKR 66.3% (female) versus 33.7% (male) was noted akin to the other reported studies. This could be due to relative quadriceps weakness, relatively increased pain perception, obesity etc. in females.[9-14] Patients in our study opted for TKR after 5.4±4.5 years of suffering with pain with no significant side predilection. Hypertension was the most

prevalent co morbidity among the patients in our study (n=141). 54% of patients were hypertensives (p=0.0001) and the lone proportion was maximum (n=82, 37.27%, p=0.0006). This was synchronous with the available literature.[15]

Cruciate retaining type of implant was used predominantly (n=218), 83.5%, p<0.0001 which is purely surgeon dependent. Postoperative functional outcome does not vary much with the type of implant used with respective to CR or CS (cruciate substituting) varieties when careful soft tissue balancing was taken care of intraopertatively.[16]

The size of the femoral component used had ranged from 2.5 to 3 for 86.4% of males; 2 to 2.5 for 79.8% of females (Table 7).

The size of tibial component ranged from 2.5 to 3 for 79.5% of males; 1.5 to 2 for 83.8% of females (Table 8).

The commonly used sizes of femoral and tibial components in this study correlate well with other meagrely available Indian studies.[9] In our study, 143 knees (54.8%) had tibio-femoral component size mismatch out of which 47.5% (124 cases) had femoral component size greater than the tibial component contrary to the study reported by Jain JP from Maharashtra wherein he had reported 4% of cases had femoral size greater than the tibial counterpart and tibial component was larger than the femoral component in 49.7% of cases when compared to 7.3% in our study.[9] Schai in American population reported data as equal in 78%, mismatched as femoral component larger than tibial in 17% and smaller in 5% of population studied.[17] The mismatch noted in the component sizes was more pronounced in Indian population when compared to the western world. This may be attributed to the splay of the medio-lateral dimension of the distal femur and proximal tibia and comparatively delayed presentation for replacement from the onset of symptoms.[18,19] 80% of the operated knees had fixed bearing curved plus insert which might have been the preferred choice of the operating surgeon to enhance stability. 41% of the operated knees had size 10 polyethylene tibial insert followed by 12.5 size in 22.9%. Appropriate insert size might have been preferred for adequate intra operative stability and soft tissue balancing. The type and size of the insert could not be compared in view of the paucity of reported literature.

Limitation of the study

Only perioperative details from admission to discharge could be retrieved. Postoperative follow up and functional outcomes could not be retrieved from the available case sheets.

CONCLUSION

This study gives a detailed insight into various aspects of the total knee replacements in a South Indian Institute. This data would be useful for manufacturing suitable implants customised for our population in the context of imported implants being in vogue. It also helps the operating surgeon to appropriately order for the accurate and desirable implants well in advance lest he should struggle intra operatively for want of better clinical outcome. Detailed morphometric and anthropometric analysis based on multicentric inputs is suggested to design better implants for the desired population.

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