CHAPTER V

DISCUSSION

Proper sizing of the prosthesis is one of the most important key factors for a successful TKA.[1, 2] TKA requires an accurate soft tissue balancing and maximal coverage of components on the bone surface to minimize the stress applied to the bone-implant interface.[3] A medial or lateral overhanging on the femur or tibia could result in soft tissue irritation and affect balancing efforts. Under-sizing of either component could leave exposed cancellous bone which could be a source of increased bleeding into the knee in the immediate postoperative period and may permit increased osteolysis from wear debris with longer follow-up. Overhanging or under-sizing femoral components could lead to altered soft-tissue tensioning and altered patellofemoral stresses.[4] Noble et al [5] have shown that improvements in the procedure and prosthetic design are still needed to restore normal function in patients after TKA.

Previous studies recommended that the femoral component should be inserted parallel to the transepicondylar axis[24, 25] or to the AP axis.[26] So we used the anatomical epicondylar (AEpi) axis for the reference line in the various measurements. The anatomical epicondylar (AEpi) axis was more perpendicular to anteroposterior (AP) axis and it provided appropriate external rotation to the posterior condylar axis than the surgical epicondylar (SEpi) axis.[27] According to Poilvache et al,[28] they were unable to locate the medial sulcus of the medial epicondyle, used by Berger et al to define the SEpi axis. Also, Yoshino et al [29] found that the more severe the osteoarthritis, the more difficult it becomes to detect the medial sulcus. The most prominent point of the medial epicondyle in their study was detectable in all knees independent of the severity of osteoarthritis. In this study, however, we used TE axis which was defined as the line between the most medial and lateral prominences of the epicondyles.

Some studies have demonstrated that Asian knees are smaller than Western knees.[10-13, 20-22] As for the femoral components, we measured the ML width after the femoral distal cut was done. Therefore, these data may be useful for the manufacturers to design the implants. The total ML width of the distal femoral condyle in this study was 64.06 mm (SD 6.31), which is similar to the Huang's study (64.3 mm).[23] However, the total ML width of the distal femoral condyle in this study is smaller than that in Ho WP's study and in Urabe et al's study.[11, 12]

In this study 40.5% (81/200) of the subjects were male and 59.5% (119/200) female. As we know that the female have smaller femurs than the male and this may explain why a smaller total ML width was found in this study. We, therefore, compared the dimensions of the femurs by separating the male from the female. Most prosthetic implant systems have only one AP length for one ML width. According to this study, the femoral components should be designed with several ML widths for one AP length to avoid overhanging or under-sizing problems at the medial or lateral condyle.

As for the tibial component, the geometry of the tibial component should match the resected surface as much as possible. This provides the best stability and load transfer. It is also important to the cemented and cementless applications. In TKA, the important dimensions are those of the tibial plateau at the level that the bone is cut, because the matching situation between the bone surface and prostheses will result in different contact stress which causes osteolysis. Therefore, prostheses of various sizes are needed. Cheng-Kung Cheng et al[9] suggested that the design of the prosthetic tibial base plate should be based on the data from resected diseased knee, rather than the normal knee and the measurement of diseased bones is more suitable than that of the normal bones since they are the ones which require total knee replacement. In the intraoperative situation, the tibial component rotation method aligns the tibial components to the medial one- third of the tibial tubercle.[3] Another method aligns the tibial component according to the femoral component rotation. Our study used the latter method. Because we believed that the rotational position of the bearing surface, which is self-aligned to the femoral component rotation, is marked on the tibia. In this study, the tibial ML length was measured with a reference to the TE axis of the femur. So the tibial component rotation should match to the femoral component rotation.

Our study shows that the distal femoral condyle and the proximal tibia of the female were significant smaller than those of the male. As for the distal femoral condyle, the Scorpio tm systems were suitable for the Thai male population. The NexGen and Sigma systems were suitable for the Thai female population but they need to be modified, i.e. the ML width of the femoral component to have a smaller size when using the large resected femoral AP length of the femoral component. As for the proximal tibia, the Sigma and the Scorpio tm systems were suitable for the Thai male and female populations.

As a result, we recommend that the femoral components should be designed with several ML widths for one AP length and divided into different sizes, depending on the resected AP lengths in a 5-mm increment for males and females (Table.5& 6).

Table.5 Demonstrates ideal femoral component sizes for Thai males

Male Size	Resected AP length (mm)	ML width (mm)
A	40	60
B	45	65
C	45	70
D	50	65
E	50	70
F	50	75
G	55	72.5
H	60	75

Table.6 Demonstrates ideal femoral component sizes for Thai females.

Female size	Resected AP length (mm)	ML width (mm)
A	36.5	52
B	40	55
C	40	60
D	40	65
E	45	60
F	45	65
G	50	65
H	55	75

Comparison the ratio femoral ML versus resected femoral AP between the resected femoral condyle in males and Thai prosthesis male femoral component (Fig.36&37)

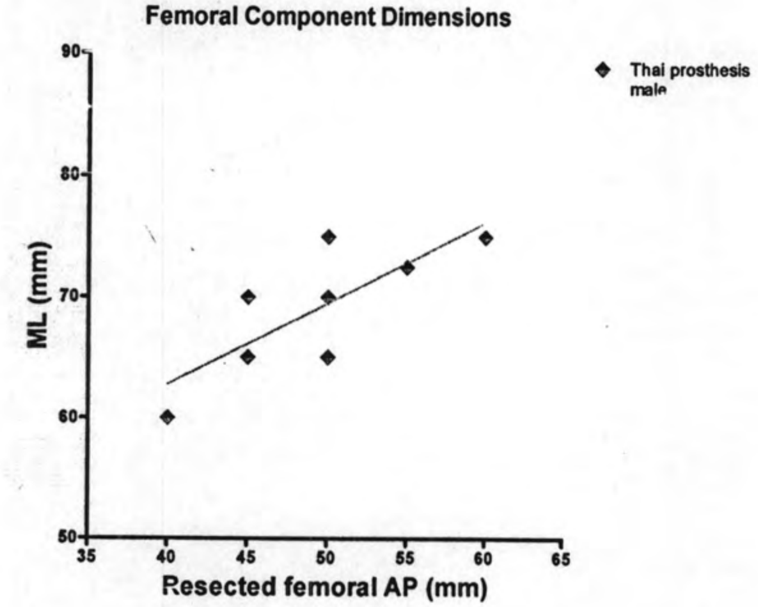

Fig.36 Graph demonstrating ratio ML width versus resected AP length of Thai prosthesis male femoral component

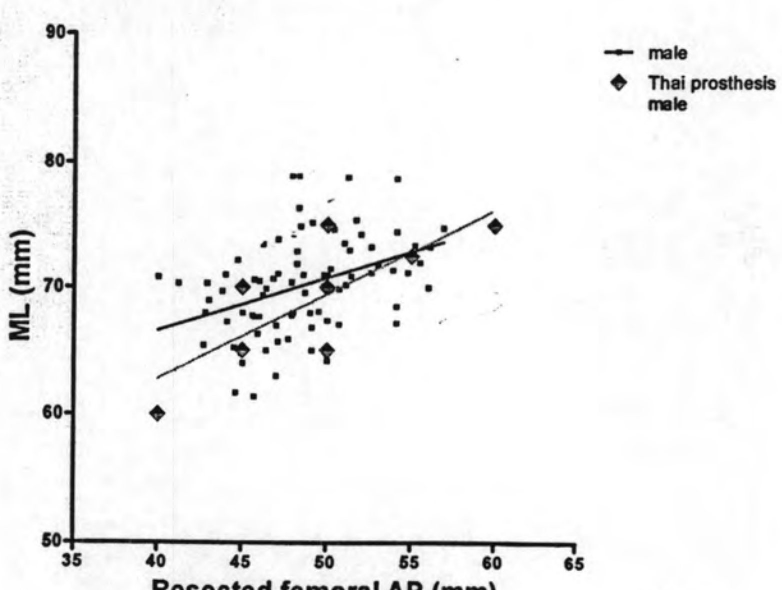

Fig.37 Graph demonstrating comparison of resected femoral AP and ML for knees in males and Thai prosthesis male femoral component

Comparison the ratio femoral ML versus resected femoral AP between the resected femoral condyle in females and Thai prosthesis female femoral component (Fig.38&39)

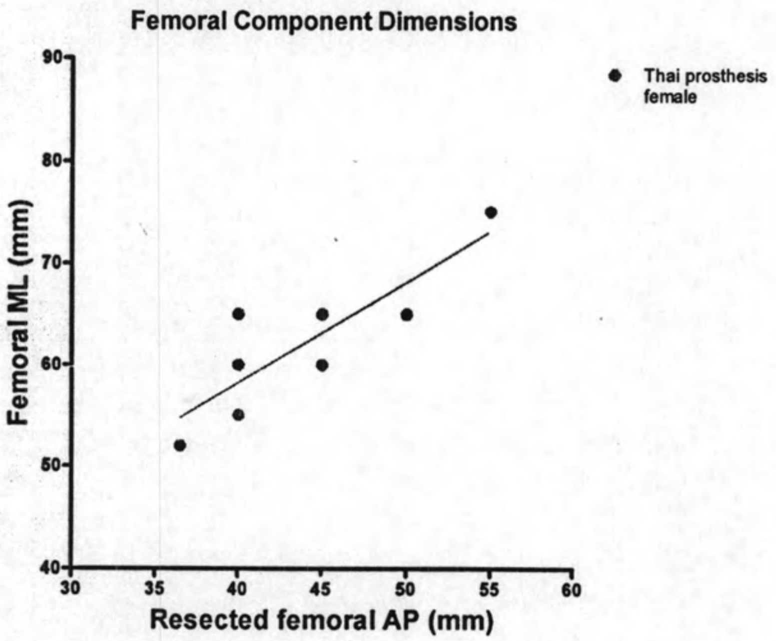

Fig.38 Graph demonstrating ratio ML width versus resected AP length of Thai prosthesis female femoral component

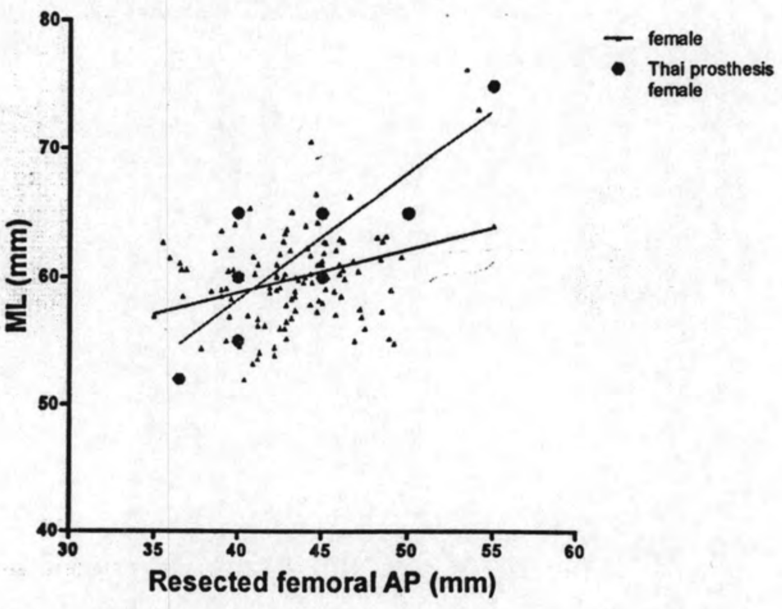

Fig.39 Graph demonstrating comparison of resected femoral AP and ML for knees in females and Thai prosthesis female femoral component

As for the tibia, we recommend the ideal size of tibia components tc be suitable for the Thai population (Table.7& 8).

Table.7 Demonstrates the ideal tibial component sizes for Thai males

Male Size	AP length (mm)	ML width (mm)
A	44	65
B	46	68
C	48	71
D	50	74
E	52	77
F	54	80
G	56	83
H	58	86

Table.8 Demonstrates the ideal tibial component sizes for Thai females

Female Size	AP length (mm)	ML width (mm)
A	38	57
B	40	60
C	42	63
D	44	66
E	46	69
F	48	72
G	50	75
H	52	78

Comparison the ratio tibial ML versus tibial AP between the proximal tibia in males and Thai prosthesis male tibial component (Fig.40&41)

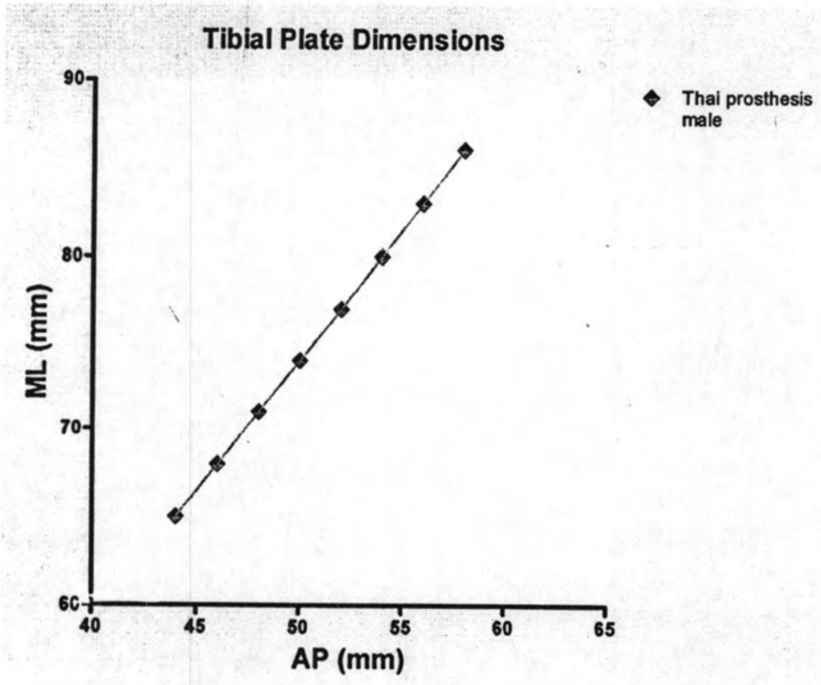

Fig.40 Graph demonstrating ratio ML width versus AP length of Thai prosthesis male tibial component

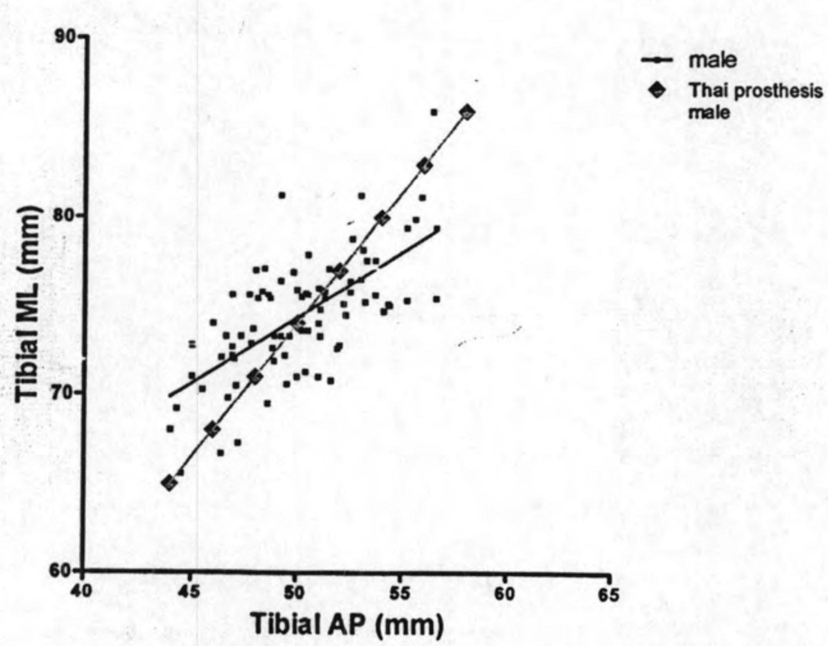

Fig.41 Graph demonstrating comparison of resected tibial AP and ML for knees in males and Thai prosthesis male tibial component

Comparison the ratio tibial ML versus tibial AP between the proximal tibia in females and Thai prosthesis female tibial component (Fig.42&43)

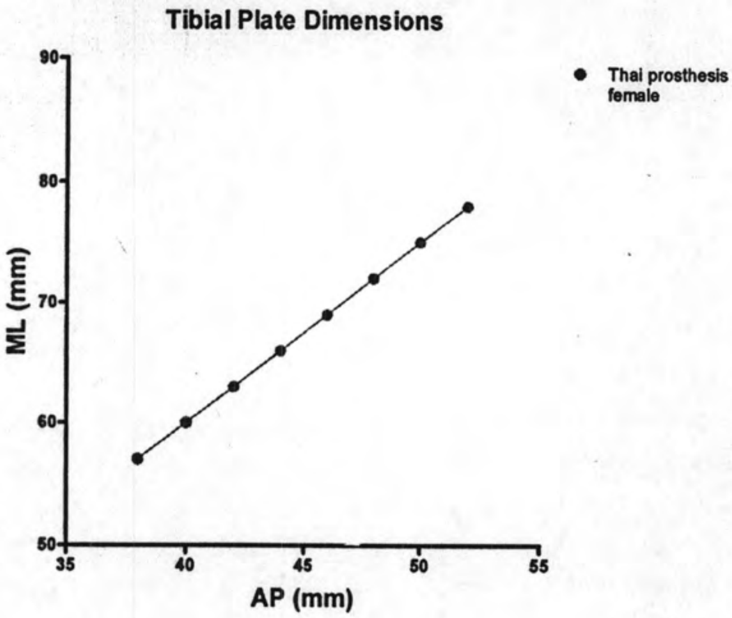

Fig.42 Graph demonstrating ratio ML width versus AP length of Thai prosthesis female tibial component

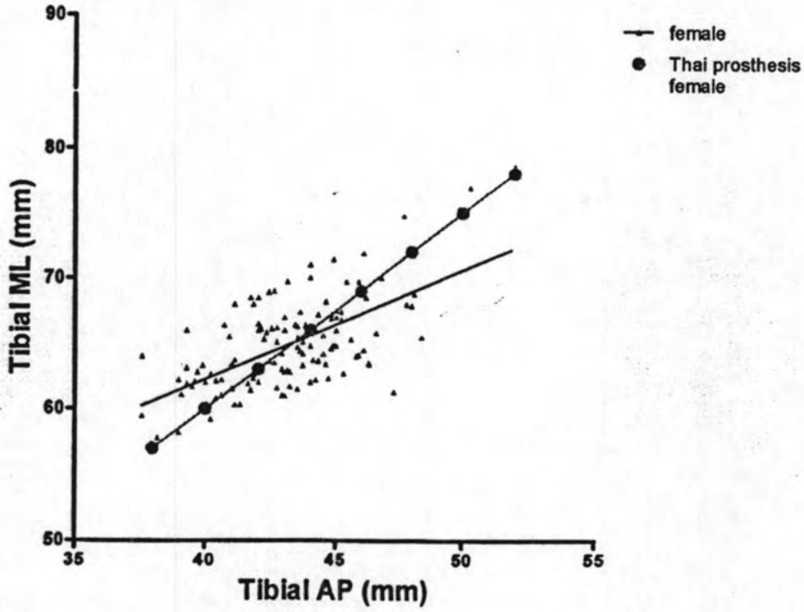

Fig.43 Graph demonstrating comparison of resected tibial AP and ML for knees in females and Thai prosthesis female tibial component