CHAPTER V

DISCUSSION

At present, the best result of the shoulder arthroplasty is to restore the anatomical of the normal patient shoulder. The accurate size of the implant and the position when we placed the prosthesis can minimize the stress on the bone implant interface and had good mechanical and good arthrokinematic of the shouder joint. A overhanged prosthesis may lead to abnormal eccentric loading on the articular surface of the glenoid that caused to poor result and longevity of the shoulder prosthesis. The difference in medioposterior offset caused the abnormal eccentric loading on glenoid. The overstuffed prosthesis can increase the force across the joint and lead to early wear of glenoid component. The larger prosthesis can cause overtension on the tendon around the shoulder joint and on the joint capsule that lead to have the most frequent problem after shoulder arthroplasty was stiffness. Excessive tension of the rotator cuff tendon leads to rupture of the repaired subscapularis and causes anterior instability. The larger diameter usually comes with the more thickness of the prosthesis head that caused lateral stretching of the supraspinatus. The lateral translation of the prosthesis head lead to decreased the movement of the shoulder joint. On the other hand, under-sizing of component could leave exposed cancellous bone which could be a source of post operative bleeding. The under sizing of the prosthesis altered the tension of the tendon around the joint and decreased the tension of the joint capsule that caused the instability of the prosthesis joint. Limitation of motion could occur from the impingement of the greater tuberosity to the glenoid and acromion process.The smaller of the prosthesis had altered center of rotation of the shoulder joint and altered the direction of tendon force across the joint especially subscapularis and infraspinatus. The superior migration of the center of rotation caused these tendon to change from abductors to adductors.

Many parameters effect to the accurate anatomical reconstruction and accurate placed of the prosthesis. In the preoperative planning of the prosthesis size, we had difficult to measure because of the destruction of the bone from the fracture or the arthritis change that alters the normal anatomic of the proximal humerus. So we usually under or over estimated the size of the head and thickness of the articular. Our study had the average diameter and the thickness of each gender that performed in Thai population and can be used for the case

that cannot plan from the preoperative radiographs. We also founded that the diameter of the articular and the thickness of the articular in female were significant smaller than in male. The neck-shaft angle, the retroversion angle, the medial offset and the posterior offset were the variable parameters because of the variable orientation. Restoration of normal anatomy during arthroplasty may be difficult with the relative fixed geometry of the existing prosthesis system. The most wide range parameter was retroversion (from anteversion to retroversion). Failure to match the shape of head potential biomechanical consequences due to the malposition of the joint line and moving center of rotation.

In this study, the average of diameter of articular surface was significant smaller than the previous study in western poplation. Not only the diameter of sphere and articular, but also medial, posterior offset and neck-shaft angle were significant difference. The neck-shaft angle in Thai population was significant higher than in previous study. About the offset in Thai population were more medial but less posterior offset than previous one. Therefore, the proximal humerus dimension in Thai populations were significant difference to the western's proximal humerus. Because of these differences, the prosthesis that suitable for western population was not suitable for Thai population.

We can assumed that the Asian population had smaller diameter of articular surface. When we compared to the prosthesis that applying in Thailand, the mismatch of the size and the thickness were found. The correlation coefficient between proximal humerus and the prosthesis was very low. This result show that the prostheses were not proper used in Thailand especially in female. However, the smallest size of both prosthesis can be applied in Thai male population that has diameter of articular surface more than 40 mm.. The several thickness sizes with the same smallest diameter are more suitable to be used for Thai male. Therefore, we recommended the smallest size of Zimmer prosthesis for Thai male patient. Nevertheless, this study compared only diameter and thickness of the articular surface because of the limitation of prosthesis data about offsets and angles. These may solve the problem that results of the shoulder arthroplasty were not good. Common complications were stiffness (limit motion) and glenoid erosion or wear. This study shows mismatch between the anatomic and the prosthesis that could explain how the complication occurred.

To correct the wide range parameters that effect to the orientation of the prosthesis, surgical technique could compensate these variation. The limitation of inclination (neck-shaft angle) of the prosthesis 134 degree and 138 degree was not suitable for everyone. According to this study, the inclination had wide range and had variation in individuals. Therefore, the fixed humeral cut in all

patient will be displaced center of rotation proximally and alterd arthrokinematics. Some study[21] recommended to orientation the inclination to the original true anatomical neck plane. This more appropriated to individual shoulder. About the retroversion, angle between anteversion 25.42 to retroversion 52.23 degree, the anatomical reconstruction of the retroversion angle should be individual. The prosthesis retroversion cut was limited between 20-40 degree to tranepicondylar axis. Therefore, the landmark of the cut was the true anatomical neck plane was more appropriate. The medial and posterior offset also had wide range and variation among the patient. Boileau et al. [22] recommended to choose smaller stem to translation medial or posterior or both. The varus placement of the smaller stem could correct the variation of medial offset and inclination. The other technique was to resected more bone posteriorly to allowed an increase in posterior offset and retroversion.

The third generation shoulder prosthesis is not only modular but also adaptable for individual bony anatomy. The adaptable prosthesis allows to correct placement of the implant and restore normal anatomy and kinematics. Nowadays in Thailand , second generation prosthesis was currently used and no third generation prosthesis existing in Thailand. According to this study, the data may be useful for the manufacturer to design the new systems prosthesis for Thai and Asian population. The size difference among gender and various articular thicnkness in adaptable prosthesis is more appropriate. The custom-made prosthesis supported by this concept, anatomic reconstruction. The image process of this study can be used to 3D reconstruction of the individual shoulder anatomy from MRI before the surgery performed, that can evaluate the size and plan for positioning of the implant. This process may be useful for the preoperative planning and implant selection in the future.

As a result, this study recommended that the size of the prosthesis should designed in different between gender. Although the same diameter of both prosthesis was found but the thickness of the articular was different among the gender. Data used K-mean cluster to classified (Table 12-15.) into 5 groups. Study shown that number of size could improve data coverage. The size of female and male prosthesis were shown (Table 16, 17.). When we compared the new prosthesis to female and male population, the more suitable prosthesis was observed (Fig. 29, 31). The size of new prosthesis was different from the currently used prosthesis (Fig. 28, 30). Therefore, currently used prostheses need to modified size and thickness before used in Thai population.

Table 12. K-mean cluster of diameter of articular in female group

Final Cluster Centers

	Cluster				
	1	2	3	4	5
diameterF	29.77	37.62	34.73	32.28	24.24

Number of Cases in each Cluster

Cluster	1	3.000
	2	5.000
	3	15.000
	4	13.000
	5	1.000
Valid		37.000
Missing		27.000

Table 13. K-mean cluster of articular thickness in female group

Final Cluster Centers

	Cluster				
	1	2	3	4	5
thicknessF	16.32	18.84	8.75	13.95	12.15

Number of Cases in each Cluster

Cluster	1	12.000
	2	2.000
	3	1.000
	4	15.000
	5	7.000
Valid		37.000
Missing		27.000

Table 14. K-mean cluster of diameter of articular in male group

Final Cluster Centers

	Cluster				
	1	2	3	4	5
diameterM	45.43	43.14	40.49	41.41	37.55

Number of Cases in each Cluster

Cluster	1	1.000
	2	8.000
	3	7.000
	4	4.000
	5	7.000
Valid		27.000
Missing		37.000

Table 15. K-mean cluster of articular thickness in male group

Final Cluster Centers

	Cluster				
	1	2	3	4	5
thicknessM	11.92	19.36	15.83	14.38	17.22

Number of Cases in each Cluster

Cluster	1	1.000
	2	8.000
	3	10.000
	4	3.000
	5	5.000
Valid		27.000
Missing		37.000

Table 16. Size of Thai female prosthesis

Articular diameter (mm.)	Articular thickness (mm.)
24	8
24	12
30	8
30	12
32	12
32	14
32	16
34	12
34	14
34	16
38	16
38	18

Table 17. Size of Thai male prosthesis

Articular diameter (mm.)	Articular thickness (mm.)
38	12
38	14
38	16
40	12
40	14
40	16
40	18
42	14
42	16
42	18
42	20
44	14
44	16
44	18
44	20
46	18
46	20

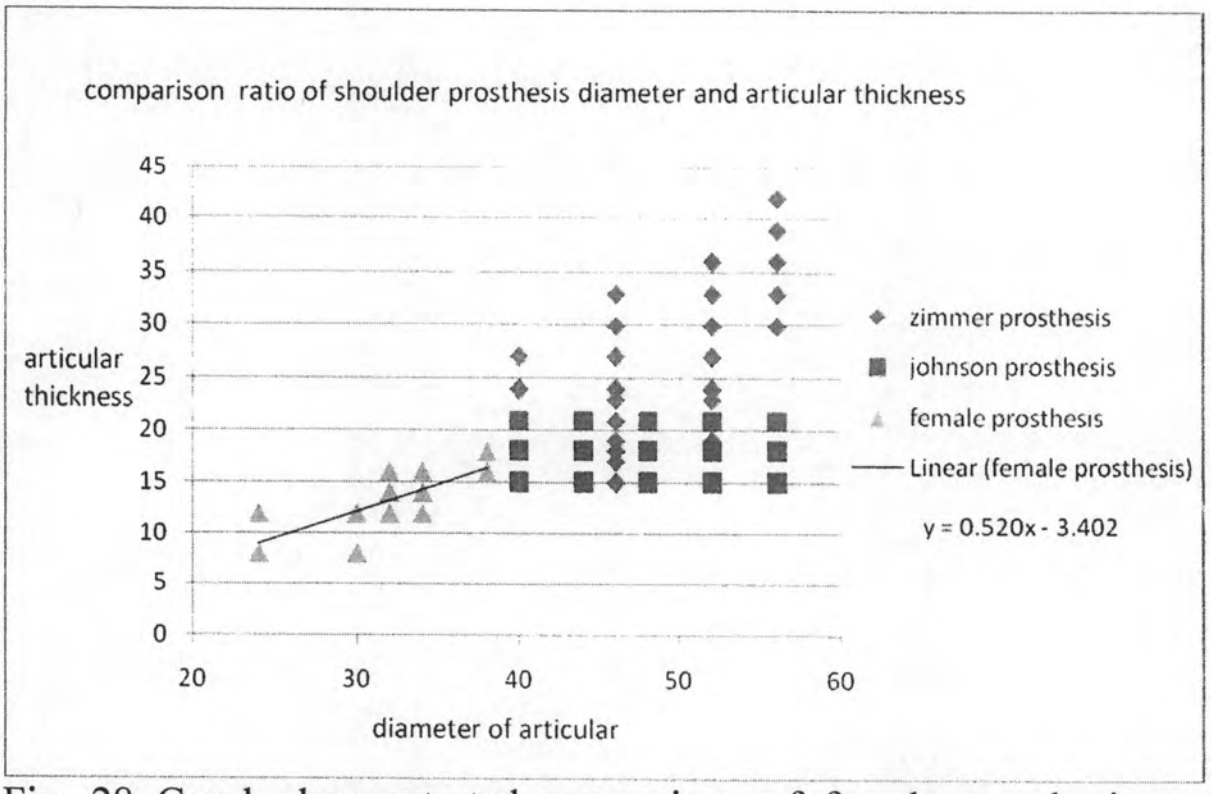

Fig. 28 Graph demonstrated comparison of female prosthesis and current used prosthesis

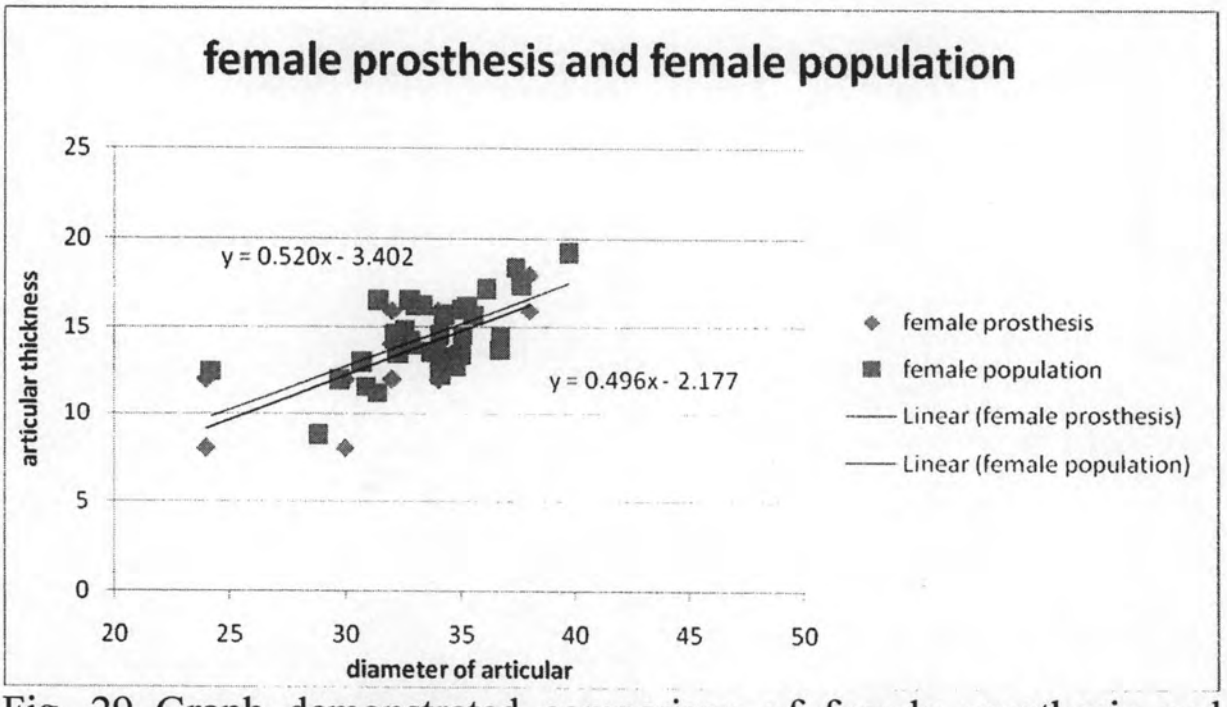

Fig. 29 Graph demonstrated comparison of female prosthesis and Thai female population

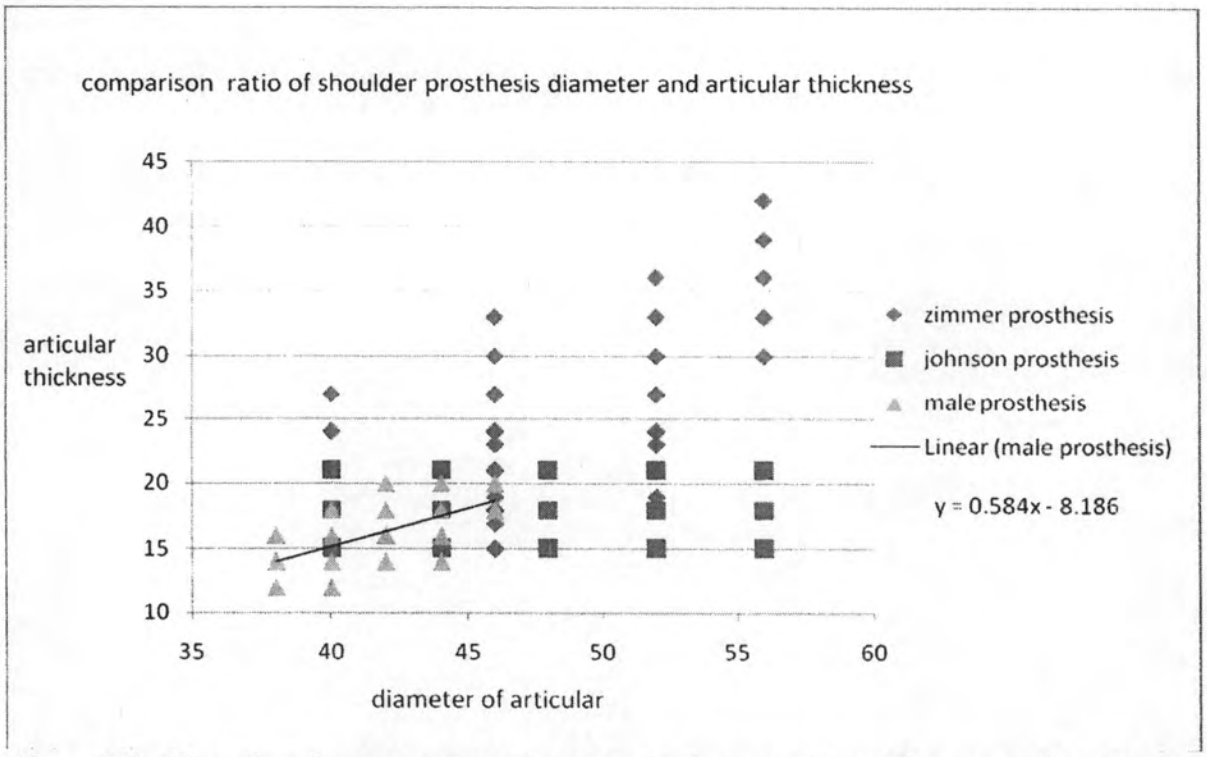

Fig. 30 Graph demonstrated comparison of male prosthesis and current used prosthesis

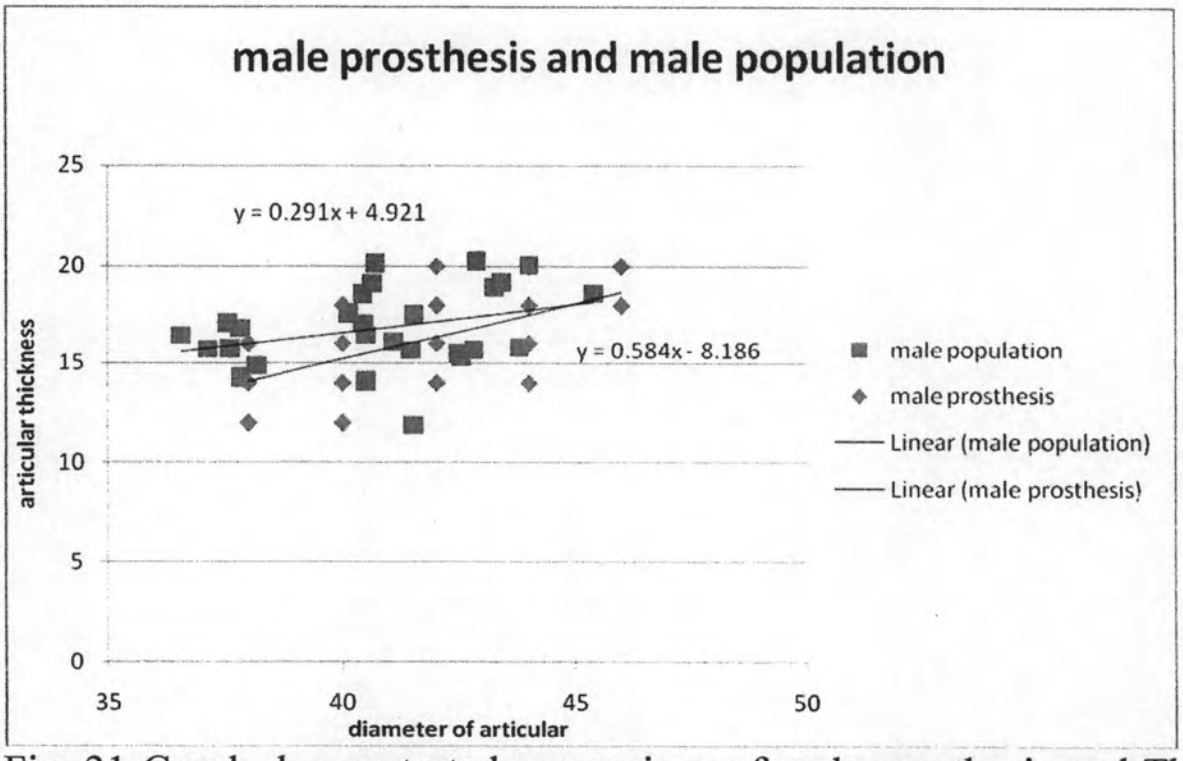

Fig. 31 Graph demonstrated comparison of male prosthesis and Thai male population