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THE USE OF TORNIQUET TO REDUCE BLOOD LOSS AT MYOMECTOMY

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ABSTRACT

Background: Fibroids remain the commonest pelvic tumour seen in women with myomectomy being the major form of treatment in our environment. Techniques to minimize blood loss will reduce patient morbidity and the need for blood transfusions. One such technique is the use of a tourniquet during myomectomy operation. This study examines the effectiveness and safety this tourniquet technique.

Method: A comparative analysis of the blood loss, transfusion rate and the morbidities associated with the use and non-use of a tourniquet during myomectomy operation at Nnamdi Azikiwe University Teaching Hospital, Nnewi Nigeria was undertaken. The Foley's urethral catheter was adapted as a uterine tourniquet and applied as low as possible at the base of the uterus before enucleating the fibroid masses.

Result: The patients who had their myomectomy performed with application of a tourniquet [tourniquet group] and those without [no-tourniquet group] were evenly matched for age, parity and presenting symptoms. The overall mean age of patients was 35.7 $\pm$ 6.1 years and parity was 0.40 $\pm$ 1.25. The main presenting symptoms of the patients were lower abdominal mass 65.6%, menorrhagia 38.7%, infertility 33.3%, abdominal pain 19.4% and dysmenorrhoea 14.0%. There was a statistically significant difference [$P < 0.001$] in mean blood loss for the no-tourniquet group [756 .4 $\pm$ 285.7] and the tourniquet group [515.7 $\pm$ 292.8] as well as the mean blood transfusion rate in no-tourniquet group [1.0 units $\pm$ 1.14] and the tourniquet group [0.24 units $\pm$ 0.51]. However there was no significant difference between the two groups with respect to complication profile.

Conclusion: The Foley's catheter form of tourniquet is cheap, safe, effectively reduces blood loss during myomectomy and significantly reduces transfusion rate while not adding to the complications due to the operation.

KeyWords: Myomectomy, Leiomyomata, torniquet, Foley's catheter, blood loss. *(Accepted 14 April 2009)*

INTRODUCTION

Leiomyomata uteri (fibroids) are tumours of the smooth muscle and the connective tissue of the uterus[1], with more than 50% of women older than 30 years having this benign tumour[2]. The exact aetiology is unknown, however associations with several factors exist and these include; race, pelvic infection, diet, parity, hormonal and genetic influences[3-5]. The diverse symptomatology of fibroids can be attributed to size, number and location of the tumours[1]. The common symptoms include the presence of an abdominal mass, menorrhagia and pressure effects[6].

Recent advances have increased the treatment options available, however, conservative follow up, medical treatment, surgical therapy and radiological intervention are still the treatment options available in our environment. Asymptomatic small sized Tumours may be adequately managed by observation and serial assessments[1], but this may not be ideal for our environment where many patients present late with large fibroids.

Medical therapy, through an option, is very expensive and the side effects are not welcomed. It is not curative and the tumour cleavage planes are lost with smaller tumours being missed if surgery is performed subsequently. Radiological intervention is still in its infancy in the West African sub-region and though quite effective, it is not readily available.

It is evident from the foregoing, that the main stay of treatment in our environment is surgery. Myomectomies are more commonly performed than hysterectomies[7], mainly due to the fact that our women desire to retain their uterus for psychological, reproductive and cultural reasons even after completing their families.

Haemorrhage is still a great concern during myomectomy and expectedly, many methods have been devised for reducing such blood loss. The use of Bonney's clamp, intrauterine injection of

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Vasopressin, preoperative administration of drugs like GnRH and misoprostol and the use of a tourniquet[8] have all been reported.

There is paucity of data on the use of the tourniquet as a devise to reduce blood loss during myomectomy particularly in our environment. This study therefore assesses its efficacy and safety by comparing the blood loss and complications (if any) associated with its use or non use.

SUBJECTS AND METHOD

The patients were seen at the gynaecological clinic of the Nnamdi Azikiwe University Teaching Hospital Nnewi with a diagnosis of uterine fibroid. They were counselled for myomectomy operation which they gave a written consent for the procedure to be performed. They were randomly allocated to any of the two groups.

Group A (No-Tourniquet): The operation was performed without the use of any uterine clamp or improvised tourniquet.

Group B (Tourniquet): The operation was performed with the use of Foleys catheter as an improvised tourniquet applied at the base of the uterus close to the insertion of the uterosacral ligaments during the surgery. This is tied in such a way that it temporarily impedes the blood supply from the uterine vessels and the infundibulo-pelvic ligament. The fallopian tubes and the ovaries are carefully excluded from the line of the tourniquet to avoid direct compression and necrosis. See photographs 1 to 4. This tourniquet is released intermittently (at about 30 minutes interval) during the surgery and finally removed after the repair of the uterus.

A comparative analysis of the post operative outcome of these two groups is performed assessing the blood loss, transfusion rate and the morbidities to determine the effectiveness and safety of this tourniquet technique for myomectomy operation. The study period covered 1st January 2000 to 31st December 2004.

Estimation of blood loss is done by counting the mops used during the operation. Each mop is estimated at 100 to 150 mls of blood depending on the degree of soaking. Only mops were routinely used during the operation for cleaning and clearing the operation field. Suction was not used.

The results are presented in the tables and compared with simple percentages using P value as a test of significance.

RESULT

The overall mean age of patients in this study was 35.7 $\pm$ 6.1 years; the no-tourniquet group had a mean age of 34.8 $\pm$ 5.8 years while the tourniquet group mean age was 34.9 $\pm$ 5.5 years.

The difference in the ages was not statistically significant (P = 0.930). The overall mean parity was 0.40 $\pm$1.25; the no-tourniquet group had a mean parity of 0.46 $\pm$1.31 while the tourniquet group mean parity was 0.35 $\pm$ 1.21. The difference between the mean parity for the 2 groups was not statistically significant (P = 0.679). Also 50.5% (n=47) of the patients were married, while 49.5% (n=46) were single. The details of the age, parity and marital status of the patients in the two groups are shown in table 1.

Presenting symptoms of the patients' include; lower abdominal mass 65.6%, menorrhagia 38.7%, infertility 33.3%, abdominal pain 19.4% and dysmenorrhoea 14.0%. The rest of the symptoms are detailed in table 2 for the two groups with the P values. There was no significant difference in occurrence of symptoms between the two groups except for dysmenorrhoea with P value < 0.05.

With respect to location, 83.9% were intramural, 53.8% were subserous and 33.0% were subrnucous. There was no statistical difference between the two groups with regard to location of the fibroids. P value is > 0.05 as shown in table 3.

The mean pre-operative packed cell volumes (PCV) in both groups were recorded as no-tourniquet group 31.9 $\pm$ 4.16 and tourniquet group 31. 0 $\pm$ 5.79. Also, 29 (31.2%) patients were anaemic (PCV < 30%) before the operation with 13 (33.4%) in the no-tourniquet group and 16 (29.6%) in the tourniquet group. The observed differences between the two groups is not statistically significant (P value = 0.425). The details are shown in table 4.

Complications recorded include post operative anaemia (34.4%), post operative pain (50.5%), pyrexia (34.4%), wound breakdown (5.4%), urinary tract infections (6.5%) and others as shown in table 5. There was no significant difference between the two groups with respect to complication profile.

The mean blood loss for the no-tourniquet group was 756 .4 $\pm$ 285.7 and the tourniquet group was 515.7 $\pm$ 292.8. The difference is statistically significant with P < 0.001. Similarly the mean blood transfusion rate in no-tourniquet group was 1.0 units $\pm$ 1.14 and for the tourniquet group it was 0.24 units $\pm$ 0.51. The difference is statistically significant with P value < 0.001. The details are shown in table 6.

Table 1: **Socio-Demographic Characteristics of the Two Group of Patients.**

A. Age range (years)	No Tourniquet no	%	Tourniquet no	%	Total no	%	P value
<25	1	2.6	1	1.9	2	2.2	
25-29	8	20.5	8	14.8	16	17.2	
30-34	7	18.0	17	31.5	24	25.8	
35-39	14	35.9	13	24.1	27	29.0	
40-44	7	18.0	14	25.9	21	22.6	
>45	2	5.1	1	1.9	3	3.2	
No. of Patients	**39**	**100**	**54**	**100**	**93**	**100**	
Mean ± SD	34.8 ± 5.8		34.9 ± 5.54		35.7± 6.1		**0.930**
B. Parity							
0	32	82.1	47	87.0	79	85.0	
1 – 4	6	15.4	5	9.3	11	11.8	
5 – 7	1	2.6	2	3.7	3	3.2	
No. of Patients	**39**	**100**	**54**	**100**	**93**	**100**	
Mean ± SD	0.46± 1.3		0.35 ± 1.2		0.40±1.25		**0.679**
C. Marital Status							
Married	23	59.0	24	44.4	47	50.5	
Single	16	41.0	30	55.6	46	49.5	
Divorced	0	0	0	0	0	0	
Widowed	0	0	0	0	0	0	
No. of Patients	**39**	**100**	**54**	**100**	**93**	**100**	

Table 2: **Presenting Symptoms of Patients with Uterine Fibroids.**

Symptoms	No Tourniquet no	%	Tourniquet no	%	Total no	%	P value
Abdominal mass	23	59.0	38	70.4	61	65.6	0.254
Menorrhagia	17	43.6	19	35.2	36	38.8	0.412
Infertility	17	43.6	14	25.9	31	33.3	0.075
Abdominal pain	9	23.1	9	16.7	18	19.4	0.440
Dysmenorrhoea	9	23.1	4	7.4	13	14.0	0.032
Irregular vaginal bleeding	5	12.8	2	3.7	7	7.5	0.100
Urinary symptoms	4	10.3	3	5.6	7	7.5	0.396
Vaginal discharge	0	0.0	2	3.7	2	2.2	-------
Recurrent abortion	0	0.0	1	1.9	1	1.1	0.393
No. of Patients	**39***	**100**	**54***	**100**	**93***	**100**	

*Some patients had more than one symptom.

Table 3: **The Location of the Fibroid Masses at Operation.**

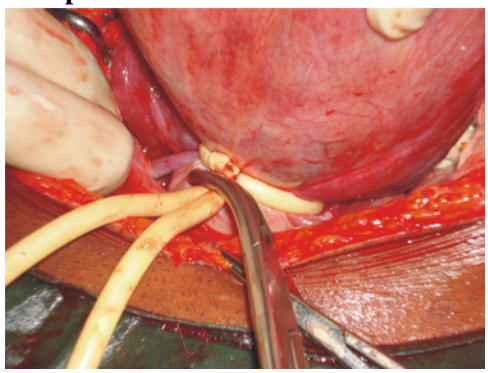
Location of the fibroid	No Tourniquet no	%	Tourniquet no	%	Total no	%	P value
Intramural	33	84.6	45	83.3	78	83.9	0.086
Subserous	17	43.6	33	61.1	50	53.8	0.94
Submucous	14	35.9	17	31.5	31	33.3	0.656
No.of Patients	**39***	**100**	**54***	**100**	**93***	**100**	

*Some patients had fibroid masses in multiple locations.

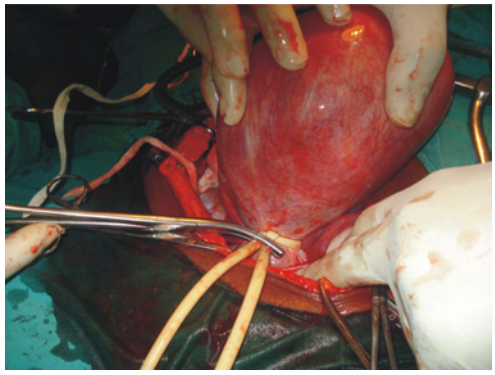
Table 4: **Pre-Operative Packed Cell Volume (PCV) of the Patients.**

Pre-op PCV	No Tourniquet no	%	Tourniquet no	%	Total no	%	P value
<25	1	2.6	8	14.8	9	9.7	
25-29	12	30.8	8	14.8	20	21.5	
30-33	19	48.7	26	48.2	45	48.4	
34	7	17.9	12	22.2	19	20.4	
No. of Patients	**39**	**100**	**54**	**100**	**93**	**100**	
Mean± SD	31.9±4.2		31.0± 5.8		31.4± 5.2		**0.425**

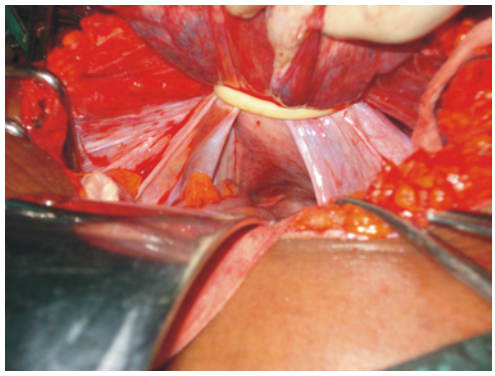
Picture1: **Anterior close up view. Tourniquet applied at base of uterus and held by strong artery forceps.**



Picture 2: **Anterior full view. Tourniquet applied at base of uterus and held by strong artery forceps.**



Picture 3: **Posterior view. Tourniquet applied at base of uterus below the ovary and fallopian tubes.**



Picture 4: **Posterior view. Tourniquet applied at base of uterus below the ovary and fallopian tubes.**

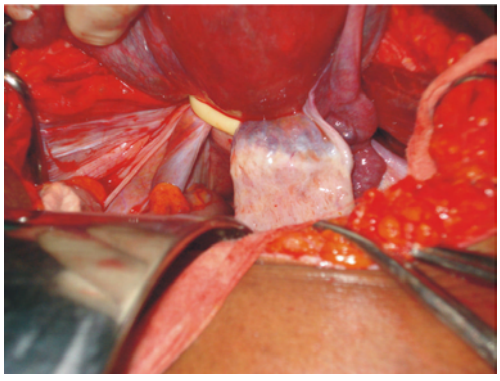


Table 5: **Complications Following Myomectomy in the Patients.**

Complications	No Tourniquet		Tourniquet		Total		P value
	no	%	no	%	no	%	
Post-op Pain	20	51.3	27	50.0	47	50.5	0.903
Anaemia	13	33.3	19	35.2	32	34.4	0.853
Pyrexia	13	33.3	19	35.2	32	34.4	0.853
Urinary Tract Infection	3	7.8	3	5.6	6	6.5	0.679
Prolonged vaginal bleeding	0	0.0	1	1.9	1	1.1	0.393
Pelvic abscess	1	2.6	0	0.0	1	1.1	0.815
Intestinal obstruction	1	2.6	0	0.0	1	1.1	0.237
Bladder injury	0	0.0	1	1.9	1	1.1	0.393
No. of Patients	**39***	**100**	**54***	**100**	**93***	**100**	

Some patients had more than one complication.

Table 6: **Blood Transfusion Rate during Myomectomy in the Patients.**

No. of units Transfused	No Tourniquet		Tourniquet		Total		P value
	no	%	no	%	no	%	
none	18	46.2	43	79.6	61	65.6	
1	9	23.1	9	16.7	18	19.3	
2	7	17.9	2	3.7	9	9.7	
3	4	10.2	0	0.0	4	4.3	
4	1	2.6	0	0.0	1	1.1	
No. of Patients	**39**	**100**	**54**	**100**	**93**	**100**	
Mean ± SD	1.00 ± 1.14		0.24 ± 0.51		0.56 ± 0.91		**0.001**

DISCUSSION

Surgical options particularly open myomectomy will remain the mainstay of therapy in our environment for the foreseeable future. The high cost of medical therapy, the relative unavailability of radiological and laparoscopic intervention and the need to preserve the uterus for fertility and femininity virtually assures this. The last factor is of particular importance in the majority of women in our cohort since their mean age (35.7 years ± 6.1), and parity (0.4 ± 1.25) show them to be in the reproductive age group and relatively low parity. Also, myomectomies, because they achieve some degree of "cure without loss of function or deformity"[9], tend to be more acceptable to the patients.

The inherent dangers and potentials for complications, during myomectomy have been severally reported[10] and rightly so. However, with the advent of safer surgical techniques, potent antibiotics and availability of safe and efficient blood transfusion services, the morbidity andmortality following myomectomy has reduced. Despite these improvements, the risk of haemorrhage still remains, due to the increased vascularity of the uterus, and the need to shell out the fibroid masses individually. With several fibroid masses, the risk increases markedly. Several techniques have been devised to reduce the loss of blood at surgery including the use of Bonney's clamp, injection of vasopressin intra-myometrially, pre-operative administration of GnRH analogue or misoprostol and the use of the tourniquet[8].

The tourniquet is by far the cheapest and most accessible for our environment. The conventional Foley's urethral catheter is easily adapted for this purpose. Bonney's clamp is not universally available; vasopressin is also scarce and may predispose to severe complications like pulmonary oedema, myocardial infarction and severe hypertension[11-13]. GnRH analogues are expensive and are associated with menopausal side effects with prolonged use. Although they reduce the size of the fibroid masses, they have been shown not to affect the amount of blood loss at surgery[14]. In addition, they cause a blurring of the planes of the pseudo-capsule and subsequently make shelling of the mass difficult and the smaller masses disappear before surgery only to regrow on cessation of the treatment.

The Foley's catheter form of tourniquet as shown in this study is very effective with significant reduction in blood loss among the tourniquet group compared to the no-tourniquet group. Our result agrees with the findings of Kongnuyi and Wiysonge[15] where significant reduction in blood loss was also noted with tourniquet usage. This reduction in blood loss logically translates into a reduction in the need for blood transfusion. This study also demonstrated a significantly lower blood transfusion rate among the tourniquet group. Considering the inherent dangers associated with blood transfusion, techniques that limit the necessity for blood transfusions should be encouraged and use of tourniquet at myomectomy is undoubtedly one of such. A clear operating field is another important advantage gained from the use of the tourniquet and is a cardinal principle of surgery[16] particularly pertinent for myomectomies. This will allow you the opportunity to remove virtually every visible piece of fibroid and may reduce your operating time.

Complication profiles for both groups were similar with no significant difference being recorded for the common complications like anaemia, post operative pain, pyrexia and urinary tract infections. It was initially surprising to note that anaemia was not significantly more frequent in the patients under the no-tourniquet group; however, this could be explained by the fact that the patients under the no-tourniquet group received significantly more bloodtransfusions to compensate for the greater blood loss.

In conclusion, the Foley's catheter form of tourniquet is cheap, safe, readily available, effectively reduces blood loss during myomectomy and significantly reduces transfusion rate while not adding to the complications due to the operation. However, the tourniquet though easy to use and effective cannot be used in patients with large cervical or intra-ligamentry fibroids[9] (unless such placed fibroid is first removed) and has to be released intermittently so as to prevent build up of toxic substances with attendant ischaemia and necrosis.

Limitations of the study

The limitations of our study include the fact that the estimations of blood loss are often not precise[17]; however, we used fairly objective method (use of surgical mops) to help reduce errors due to this. Secondly, the number of patients in both groups is not large, and therefore rare complications may not be documented in these groups. Long term complications also need to be documented with good patient follow up. Of particular interest are recurrence rate, adhesion formation, ovarian failure and effect on uterine physiology and future fertility.

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