COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF ANESTHESIA

MAGNITUDE OF POSITION RELATED SOFT TISSUE INJURIES AND ASSOCIATED FACTORS AMONG ELECTIVE ADULT SURGICAL PATIENTS AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA ETHIOPIA 2021

A RESEARCH THESIS TO BE SUBMITTED TO DEPARTMENT OF ANESTHESIA, SCHOOL OF MEDICINE, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR MASTER OF SCIENCE IN ADVANCED CLINICAL ANESTHESIA

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ADDIS ABABA, ETHIOPIA

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Title	**MAGNITUDE OF POSITION RELATED SOFT TISSUE INJURIES AND ASSOCIATED FACTORS AMONG ELECTIVE ADULT SURGICAL PATIENTS AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, 2021**
Study design	**Hospital based cross sectional study**
Study period	**January 1, 2021 to May 30, 2021**
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Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfillment of the requirements for the Master of Science degree in Anesthesia. I understand that plagiarism will not be tolerated and all directly quoted material has been appropriately referenced

Name: _____

Signature; _____

Submitted to; MSc Tutor, Department of Anesthesia Addis Ababa University.

Date of Submission: _____

This thesis work has been submitted for examination with my/our approval as Advisors and Tutors on the Master of Science degree in Anesthesia

Name	Signature
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2. _____	_____
3._____	_____
4._____	_____

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ABSTRACT

Background: Position related soft tissue injuries are the cause of additional suffering for surgical patients, increase hospital stay and treatment costs. Though its prevalence is under reported, its consequences range from acute mild injuries to lifelong disabilities.

Objective: To assess magnitude and associated factors of position related soft tissue injuries among elective adult surgical patients at Tikur Anbessa Specialized Hospital, Addis Ababa.

Method: An institutional based cross-sectional study design was conducted among 292 elective adult surgical patients at Tikur Anbesa specialized hospital from January 1, 2021 to May 30, 2021. Systematic random sampling technique was used and data collected by pre tested questionnaire through data retrieval from chart and observation in the PACU. Both bi-variable and multi-variable logistic regression analysis were done to evaluate the association between dependent and independent variables. Level of statistical significance was decided at p-value less than 0.05.

Results: The magnitude of position related soft tissue injuries in our study was 9.6%. Body Mass Index (BMI) <18.5, Lateral position, prone position, non- use of positioning aids and duration of surgery >4 hours were found to be independently associated with position related soft tissue injury.

Conclusion: Our study found that magnitude of position related soft tissue injury was 9.6%. BMI <18.5, surgery duration >4 hours, lateral positioning, prone positioning and non- use of positioning aids were an independent predisposing factors for development of position related soft tissue injury.

Key words: position; soft tissue injury; Tikur Anbessa Specialized hospital

ACRONYMS

AORN American Association of perioperative Registered Nurses

AOR Adjusted Odds Ratio

BMI Body Mass Index

CI Confidence Interval

COR Crude Odds Ratio

EPUAP European Pressure Ulcer Advisory Panel

FMOH Federal ministry of health

G.C Gregorian calendar

NPUAP - National Pressure Ulcer Advisory Panel

OR Operating Room

PACU Post Anesthesia Care Unit

SPSS Statistical Package for Social Sciences

CHAPTER ONE: INTRODUCTION

1.1 Background

Surgical positioning is the act of putting a patient in a specific physical position during surgery. The primary aim in choosing and adjusting a particular surgical position is to maintain the patient's safety while simplifying access to the surgical site. Usually a patient must be placed in an unnatural position to gain access to the specific procedure location (1).

When a patient is positioned for surgical procedure, the position to use is determined on the basis of surgery type, the surgeon's choice and the anesthetist's comfort for ease access to the airway, venous and arterial lines. The operation theatre staffs must keep the patient on a safe position by aligning the body of the patient adequately on the operation room table to reduce the degree of skin and other soft tissue injuries (2,3).

The operating team shares the responsibility of proper patient positioning to reach the target organs to be operated, which is a balance between optimal surgical access and safety of patient. Different patient positions are required to provide access for different surgical procedures. Each position has implications for ventilation and hemodynamics, as well as exposing patients to possible complications such as nerve and pressure area injury (4,5).

Basically adopted surgical positions include supine, lithotomy, lateral, and prone. Supine position is used by keeping patients lie on their back and for most either open or closed urologic, gynecologic and neurosurgical procedures. Some of these procedures are modified with a Trendelenburg position for better visualization of the lower abdominal viscera (6,7). Lithotomy position is used mainly for urologic and gynecologic procedures. Transurethral procedures like ureterostomy, urethroplasty, and vaginal hysterectomy and anterior colporrhaphy. It is also used for open procedures involving the perineum, anus or proximal urethra. Lateral decubitus position is used for access to the kidneys, adrenal glands, retroperitoneal approach to thoracolumbar spine and most of thoracic procedures.

Prone positioning is used for access to the retro peritoneum and upper urinary tracts posterior fossa, suboccipital region and posterior approaches to spine. Common surgeries performed are percutaneous nephrolithotomy, adrenalectomy and lumbotomy (8–12).

Yearly, it is estimated that 310 million surgical procedures are performed around the world; moreover, there is a significant increase each year. Surgical and/or anesthetic complications are among the most often avoidable adverse events, and soft tissue injuries resulting from surgical positioning are remarkable (13).

Position related soft tissue injuries happen when extrinsic pressure comes greater than the normal capillary filling pressure of approximately 32 mm Hg. Blood flow to the compressed area is blocked, which results in tissue ischemia and necrosis. Pressure injury is directly related to the duration surgical procedures. Particularly, the total duration of surgery is related to the development of position related soft tissue injury. For every 30 minutes surgery that lasts beyond four hours, the risk for a position related soft tissue injury increases by approximately 33%. Some evidences of studies suggest varieties of position related soft tissue injuries occurrence rates related to surgical positioning to be 13% in USA, 10.1% and 21.7% in Brazil (14–16).

The patient under anesthesia and surgery doesn’t complain about his/her discomfort and pain due to anesthesia and may not also get early recognition from the operating theatre team which makes him/her highly susceptible for developing position related soft tissue injuries. Once the patient developed position related soft tissue injury, it might be either short term or may further result in long term disability. Unnecessary treatment costs, exposure to infection, delayed discharge from hospital are additional risks posed by the development of position related soft tissue injury. Immobility during surgery, anesthesia technique, surgery duration and patient clinical status of having comorbidities, sex and age are believed to be contributing to development of positioning related soft tissue injuries (17–20).

When the magnitude of position related soft tissue injury is studied, nerve injury is the frequently reported injury in literatures, but it was not covered in our study due to lack of expertise and equipment availability during entire data collection period to identify nerve injury from other types of injuries.

1.2 Statement of problem

As intraoperative patient positioning has its own implication on patients' physiological responses and also results in soft tissue damage due to continuous pressure applied on body surface, anesthetists have an almost equal responsibility to provide appropriate care for patients undergoing anesthesia and surgical procedures (21).

Even if hospitalized patients in immobile state have an increased risk of developing position related soft tissue injury, anesthetized patients undergoing surgery are at even greater risk. However, little is known about the magnitude of position related soft tissue injury that occurs during intraoperative and immediate post-operative period (22).

Surgical positioning injuries or soft tissue injuries could be avoided when there is appropriate adherence to standard patient positioning guidelines. The increase of occurrence posed additional suffering for affected patients, increase the time spent in hospital, and involve additional un-necessary treatment costs, for materials and personnel to treat the injury and also patient dissatisfaction to health service given in the health facilities, especially in the operation theatres (23).

Studies confirmed that position related soft tissue injury to be 6.6% with an average duration of surgery of 5.5 hour. Patient and surgical factors including longer surgery time, having co-existing disease, older age, type of position used and misuse of pressure relieving materials were reported as a contributing factors for development of position related soft tissue injury (24–26).

Improperly positioned patients encounter intraoperative adverse effects which imposes some injuries ranging from temporarily occurring minimal acute soft tissue injuries to permanent and long-term functional impairments, additional morbidity or even death. The skin and soft tissues, the joints, the ligaments and bones as well as the eyes, nerves and vessels are mainly affected with positioning injuries if standard guidelines of positioning, and appropriate positioning accessories are not practised and used properly (23,25,27).

In our study setup, we tried to search for any evidence of post-positioning outcome after different surgeries and could not find any article on position related soft tissue injuries even if we have

encountered different incidents during our clinical practice that might be resulted in discomforts and injuries not present before admission.

Studies done in other countries reported there were soft tissue injuries due to intraoperative positioning which sought proper attention to prevent and treat them. As far as our knowledge and ability of searching literatures, there were no available data in the study area on the problem, and the present study tried to identify the magnitude and associated factors of position related soft tissue injuries.

1.3 Justification of study

Improper positioning of surgical patients is a major problem in the world that negatively impacts numerous aspects of patients' health. Evidences show that taking appropriate measures during surgical positioning to prevent pressure injury reduced post injury treatment expenditures by 90% and the reverse is also true for or even more if there is reluctance at prevention. (26).

It is important to identify individuals at risk and plan proper interventions for preventing development of position related soft tissue injuries which imposes greater responsibility on surgical team working in the operation theatre.

Some institutions developed prevention and management protocols for position related soft tissue injury in the perioperative period (15). In Ethiopia, particularly in study setup, we found no standardized perioperative strategies and guidelines for prevention and treatment of position related soft tissue injuries.

This study would help the Ministry of health, and the health policy developers as an input. It is believed to contribute some evidences to reduce preventable positioning related patient injuries caused only by being under anesthesia and surgical positioning. It also contributes the anesthetists and responsible surgeons during positioning to give attention to the gap of safe patient positioning.

As our search was conducted, there was no research done on a similar topic in Africa and Ethiopia. Thus, it could be used as a baseline source of information for further researches and add some inputs to the literature.

CHAPTER TWO: LITERATURE REVIEW

Even though the best surgical access depends on optimal positioning, special attention should be paid to minimize the risk of soft tissue injury and bad outcomes that can occur. Surgical procedures involve different positions for access to the target organ for which surgery is indicated. Each position carries some risk which is more profound especially in patients undergoing anesthesia. Tissue compression, stretch, blunt or sharp trauma, air embolism, organ under perfusion, and ischemia can be regarded to result in position related soft tissue injury though exact mechanism is unclear (24,28). Positioning related soft tissue injuries are usually preventable and were first documented in the 1800s. It is essential to differentiate the injuries due to positioning from those injuries occurring due to other medical or previous traumatic causes (4,28,29).

According to survey undertaken by J. STUART WOLF and colleagues in 2000 (US), the incidence of position related soft tissue injury during laparoscopic urological procedures was found 2.7%. Factors contributing to positioning injury were noted as patient related or operative related. Patient related factors were BMI, variant anatomy, and comorbidities such as diabetes mellitus and vascular disease and also physical position on the operating room table and duration of surgery as operative related factors (30).

A four years prospective study to asses development of position related soft tissue injury by Zappa et al in 2007 in Washington DC compared patients operated under lithotomy and other non- lithotomy position. They found development of injuries due to position, which occurred in 1.7% of patients undergoing lengthy cytoreduction surgery, thought to result from traction exerted on the popliteal vessels from movement of the body in a cranial direction. They also got the evidence that the problem is highly associated with prolonged duration of the position and surgery (31).

According to retrospective study done in University hospital of Singapore on spine surgical procedures in the prone position to determine the magnitude of position related soft tissue injuries for 3-year period on 209 elective study subjects, 23% of patients developed position related soft tissue injuries of various degrees of severity. Body mass index > 30kg/m2, prolonged

operative time > 5 hours were independently associated with the development of position related soft tissue injuries (32).

MENEZES, et al conducted a one year prospective observational study on 172 patients from different surgical specialities in Portugal in 2013. They reported that 12.2% of patients developed perioperative positioning injuries. In the group that developed injuries, no significant difference with regard to age, sex, anesthetic technique, duration of surgery and positioning was found. The Body Mass Index > 30 Kg / m2 and having co-existing diseases were reported to have a statistically significant association with the development of position related soft tissue (33).

Amit Gefen and his colleagues described on their systematic review in Tel Aviv, Israel, that a Position related soft tissue injuries identified within an immediate postoperative time considered an intraoperatively acquired injury. Their finding noted that the overall rate of these intraoperatively acquired soft tissue injuries vary substantially, from 12% to 66%. The prevalence of soft tissue injury among surgical patients for procedures that last longer than 3 hours is at least 8.5% (34).

A retrospective study done by Bithal et al in Riyadh, Saudi Arabia found that incidence of position related soft tissue injury was 14.7%. The study was conducted for one year on 307 elective spine surgery on prone position to assess incidence of skin injuries developed following surgical position. It was concluded that the incidence was proportional to the duration of positioning and weight of the patients; face was the most commonly affected body area (35).

Systematic review was conducted by Zillioux and Krupski to assess incidence of positioning injuries in minimally invasive surgical procedures, University of Virginia, USA in 2017. It was reported that the true prevalence after surgery is likely 2%–5%. Surgery length >5 hours, and both extremes of BMI were significantly associated with position related soft tissue injuries (36).

A descriptive cross-sectional study conducted for one year by Ali et al, in teaching hospital of Tehran, Iran, 2020 on 160 patients who undergone spine surgery on prone position found that incidence of skin injury was 7.6%, especially redness, in the postoperative period. There was

also evidence that age > 70, duration of surgery > 4hours, and general anesthesia were significantly associated with increased incidence of skin damage (37).

Association of perioperative Registered Nurses (AORN) "Guidelines for positioning the patient" notified that the incidence of positioning-related pressure sores occurring as a result of positioning during surgery may be as high as 66% if proper attention is not paid to patients under anesthesia and surgery as immobility and no sense of discomfort increases risk of tissue damage (38).

An observational follow up study conducted in Taipei, Taiwan in 2014 to find the incidence and associated factors of position related pressure injury among 297 elective adult surgical patients found the incidence of soft tissue injuries during the immediate postoperative period in the post anesthesia care unit 9.8%. They found also that surgical positioning is significantly related to development of position related soft tissue injury (39).

Systematic review conducted in Denmark by Haisley et al and 2009 Association of perioperative registered nurses guidelines reported that when surgery duration is prolonged over 4 hours, the chance of developing soft tissue injuries due to surgical positioning increases three times than procedures ended in less than four hours. (3,40)

A longitudinal study conducted by Bulfone and his colleagues in Italy for the primary aim of identifying incidence of pressure sores and associated factors on 102 elective adult patients underwent surgery from different specialties confirmed that surgery lasted greater than 6.15 hours was the most important independent risk indicator for development of position related soft tissue injury and they finally theorized that preventing this injury is made possible by using proper pressure relieving materials since it is impossible to limit the length of surgery once the surgical procedure is started (41).

Conceptual frame work

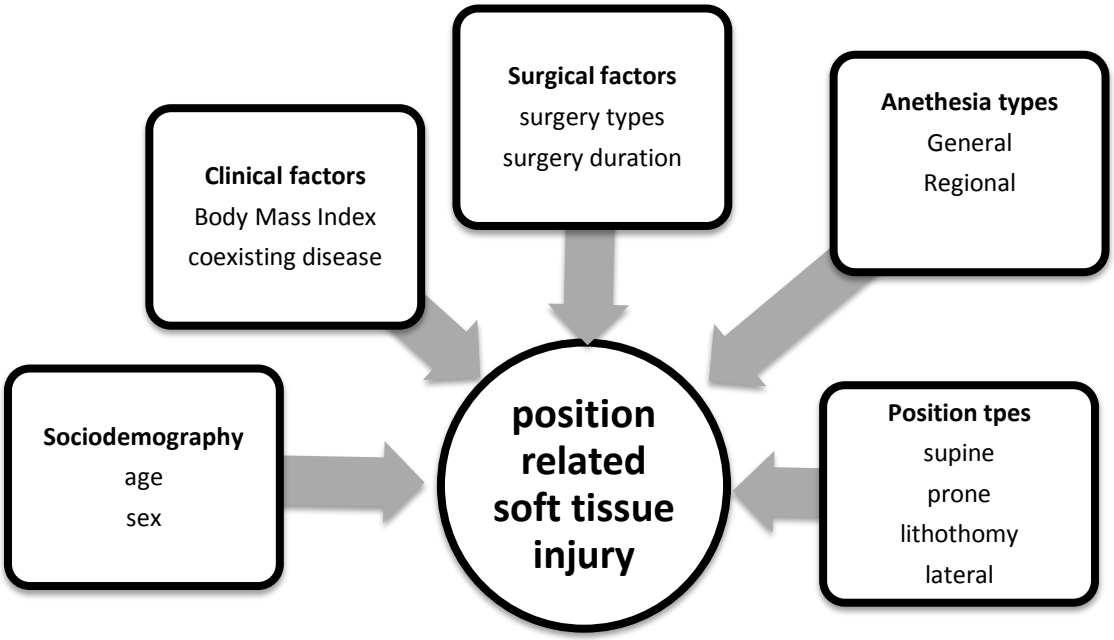

Figure 1: Conceptual framework of position related soft tissue injury and associated factors (2,3,5,23,35)

CHAPTER THREE –OBJECTIVE

3.1 General objectives

To assess the magnitude of position related soft tissue injury and associated factors among elective adult surgical patients in Tikur Anbesa Specialized hospital (TASH), from January 1 - to May 30-2021

3.2 Specific objectives

1. To determine the magnitude of position related soft tissue injury among elective adult patients who underwent surgical procedures
2. To identify associated factors contributing to position related soft tissue injury among adult patients who underwent elective surgical procedures

CHAPTER FOUR –METHODOLOGY

4.1 Study Area and period

The study was conducted at Tikur Anbesa specialized hospital (TASH). This hospital is the largest, multi-specialty tertiary care teaching hospital located, in Addis Ababa, Lideta Sub-city, Ethiopia. TASH opened for service since 1972 and, in 1998 it was transferred to school by MOH since then it became a university teaching hospital. It offers diagnosis & treatment for approximated total 370,000-400,000 patients and 2500 to 3000 elective surgery in a year. It provides general medical services for a city of over 3 million people, and those referred from different parts of Ethiopia. TASH is now the main teaching hospital for clinical and pre-clinical trainings of most disciplines. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation. It has about 800 beds, and 17 operation theatre and approximately 7000-9000 patents undergo surgery in a year including emergency surgery (taken from TASH – Hospital Management Information System (HMIS) report of 2020 G.C).

4.2 Study design

A Hospital based cross-sectional study design was conducted from January 1, 2021 to May 30, 2021 G.C

4.3 Population

4.3.1 Source Population

The source population was all surgical patients who underwent surgery at TASH

4.3.2 Study Population

All non- emergency adult surgical patients who underwent surgical procedures at TASH from January 1, 2021 to May 30, 2021 G.C.

4.1 Eligibility criteria

4.1.1 Inclusion criteria

- ✓ All elective adult patients who underwent surgical procedures in the Major operating rooms of TASH.

4.1.2 Exclusion criteria

- ✓ Patients with pre-existing soft tissue injury
- ✓ patients directly admitted from OR to ICU

4.2 Sampling Technique and Sample Size Determination

4.2.1 Sample size calculation

Sample size was determined using the finite population correction formula. Since no related study was found in Ethiopia and even Africa, P=0.5 was used for calculation of sample size, 95% level of significance, 5% margin of error and 10% for incomplete or as contingency data was used.

Using this formula: Sample size $(n) = \frac{\left(Z\frac{\alpha}{2}\right)2 \times p \times q}{(MOE)2}$

Where n = sample size, $z\frac{\alpha}{2}$ = 1.96, p =0.5, q = 1- p = 0.5; MOE = 0.05, CI = 95%, and α = 5%.

$n = \frac{(1.96\ )\ x\ (0.5)\ x\ (1-0.5)2}{(0.05)2}$; n = 384

Where sample size = $\frac{n}{1+\frac{n}{N}}$ in which N =850 (estimated target population in the study period).

Notice: The desired sample size was decided with the above formula as the source population is less than 10,000.

So, the final sample size = $\frac{384}{1+\frac{384}{850}}$ = 264.5 => 265.

We added 10% of the sample size for the non- response rate (i.e., 265+ 26.5 =291.5). Therefore, a total sample size of 292 patients who underwent elective surgical procedures was planned to participate in this study.

N.B: MOE = Margin of error

$\boldsymbol{Z\frac{\alpha}{2}}$ = Critical value of normal distribution at $\boldsymbol{\frac{\alpha}{2}}$

p = sample proportion

n = sample size

CI = confidence interval at 95%

N = total number of patients who undergone elective surgery 3 months prior to start of data collection

4.2.2 Sampling technique

Systematic random sampling method was used. The principal study subjects were all patients scheduled for elective surgery and their names selected and included in the surgery list. Lists of all adult patients scheduled for elective surgery were collected from the theatre lists submitted to operating theatre by different surgical specialities a day prior to the scheduled surgical procedures. After Situational analysis was done for 3 months before the start of the study, an average of 283 elective surgery were done per month. Hence, total number for 3 months was 850. We decided K using the formula: K=N/n; where, n = total sample size, N = population per 3 months. K=850/292 ≈ 3. Therefore, the sampling interval was three and the random start was selected using the lottery method from the daily schedule list. Every day before elective surgery started patients were selected by systematic random sampling technique. So, every third patient on the list was included.

4.3 Study variables

4.3.1 Dependent Variables

Position-related soft tissue injuries (Yes/No)

4.3.2 Independent Variables

Demographic factors/patient factors

- Age
- Sex
- BMI

Preoperative clinical characteristic

- Pre-existing co-morbidities

Surgical and anesthetic factors

- Type of surgery
- Type of anesthesia
- Position during surgery
- Positioning aids use
- Duration of surgery

4.4 Data Collection process

A planned structured questionnaire was used to collect data. It was collected by four data collectors with two assigned supervisors. Questionnaires were modified and prepared from articles in the literature reviews, 2019 American association of perioperative registered nurses (AORN) and 2015 German patient positioning injury prevention guidelines.

Data collection was started on the operation theatre corner, continued intraoperative and ended at the recovery room. Presence and absence of chronic disease history retrieved from patient chart, the type of position employed and positioning tools/aids used were recorded during intraoperative time. At the end of the surgery, the patient was re-examined for any soft tissue injuries including periorbital edema, redness of the conjunctiva, lip edema, Erythema of pressure areas and lower limb swelling due to positioning. Injuries recorded after visual assessment of patients signs.

To identify position related soft tissue injuries in the immediate postoperative time at Post Anesthesia Care Unit (PACU), the following body areas of patients were observed according to the position used for surgery:

Supine position: Occipital region, scapula, iliac crest, spinous process, sacrum, Achilles tendon, heel

Lateral position: Ear, shoulder, anterior iliac spine, trochanter, thigh, lateral knee, medial malleolus, lateral malleolus

Lithotomy position: Scapula, spinous process, elbow, sacrum and pretibial areas

Prone position: Forehead, eyes, knee, lips, periorbital area, nose, chin, trochanters, breasts

Completeness of collected data was overseen by the principal investigator and trained supervisors. Informed consent was first obtained by data collectors before the start of data collection.

4.5 Data Processing and Analysis

At the end of each day of data collection, data completeness was checked to verify correctness and enable retrieval of any missing information. Data were coded, edited and entered to EPI Info version 7 software and exported to Statistical Package for Social Sciences (SPSS) software version 26. Descriptive statistics were used to summarize data, tables and figures for displaying results and variables such as age, gender, BMI, associated co-morbidities, position of the

patients, positioning aids use, type of anesthesia and duration of surgery were analyzed. Hosmer – Lemeshow goodness of fit tests were used to confirm fitness of logistic regression model. Bi-variable and multivariable logistic regression analysis were done to identify presence of associations between outcome and predictor variables using binary logistic regression model, and odds ratio with 95% confidence intervals was used to determine the degree of association between outcome and predictor variables. Variables with a p-value less than 0.25 in the bi-variable logistic regression analysis were selected for multivariable analysis. All the statistical tests were performed at a 5% significance level. Crude and adjusted odds ratios with 95% confidence intervals were reported. The final result was interpreted depending on their association of significance at $p \leq 0.05$ and presented by using text, tables, and charts.

4.6 Data Quality Control

Addis Ababa University Institutional review board and the applicable executives of TASH approved the study. The study was conducted according to the ethical standards ratified by the 1964 Declaration of Helsinki and its amendments. We assured quality of data before, during after collection of data. Data collectors were trained on each section included in the study tools, objective, relevance of study and right of respondents. Pretest of the questionnaire was done on a 5% of the sample size at St. Peter's specialized hospital. During data collection, regular supervision and follow up was made. Principal Investigator cross checked for completeness and clarity of collected data daily.

4.7 Dissemination of result

To make this study available for researchers, experts and policy makers, the completed paper will be submitted to College of Health Sciences, Department of anesthesia. In addition, a copy of this material will be given to TASH, Addis Ababa University student research office and Ethiopian Association of Anesthetists. The result will also be disseminated through publication in peer reviewed local and international journals and through presenting it in related workshops and seminars.

4.8 Ethical Consideration

Before the start of the study, ethical clearance was obtained from the Departmental Research and Ethics Review Committee (DRERC) of the Department of anesthesia, School of Medicine, college of Health Sciences of Addis Ababa University and acceptance was also obtained from the study institution (TASH). Moreover, full clarification about the purpose of the study was made to the Authorized person of the health facility. The purpose of the study was explained to the patient who participated in the study. Informed consent from the patients was asked and obtained; confidentiality of the information was kept by using code numbers and locking the questionnaires.

4.9 Operational definitions

Position related soft tissue injury: any lesion caused by unrelieved pressure resulting in damage to the tissues not present before surgery but developed only due to surgical positioning

Conjunctival redness: Erythema of the conjunctiva caused by capillary congestion due to persistent pressure seen after surgical positioning

Elective surgery: Planned and non- emergent/not urgent surgical procedure

Adult surgical patient: Individual with age 18 years or greater, treated with surgery

Periorbital edema: Swelling of the skin surrounding the eye/s seen after surgical positioning

Lip edema: Enlargement of one or both lips due to stay on certain surgical positioning, particularly when on the dependent posture, seen at the end of surgery.

Immediate postoperative: At discharge from operation theatre to PACU

CHAPTER FIVE: RESULT

5.1 Socio-demographic and preoperative clinical characteristics

A total of two hundred ninety two study participants were involved in the study as all the data were complete. Among all study participants, 133 patients (45.5%) were age group between 18 - 44 years. The minimum age was 18 and maximum 81 with a mean age of 47.1 ±15.7. Further details are displayed in table 1 below.

Table 1: Socio demographic and preoperative clinical characteristics of elective surgical patients who underwent elective surgery at TASH from January 1, 2021 to May 30, 2021

Variables	Category	Frequency	Percent
Gender	Male	148	50.7
	Female	144	49.3
Age	18 – 44	133	45.5
	45 – 64	102	34.9
	≥ 65	57	19.5
BMI	< 18.5	54	18.5
	18.5 – 24.9	198	67.8
	25 – 29.9	29	9.9
	≥ 30	15	5.1
Co – existing disease	Hypertension	39	13.4
	Diabetes M.	27	9.3
	PVD	15	5.1
	Obesity	15	5.1
	Other	22	7.53

Other co-existing diseases were anemia, renal disease, asthma and Liver disease constituting 10, 6, 4, 2 respectively.

5.2 Anesthetic and surgical characteristics of elective patients underwent surgery

Of the total 292 patients, greater than half of the patients operated under general anesthesia, 168(58%), the remaining 124(42%) procedures underwent regional anesthesia. The most frequently used type of position for surgical procedures was supine 152(52.4%) and mostly used positioning aid was armboard.

Table 2: Anesthetic and surgical characteristic of patients who underwent elective surgery at TASH from January 1, 2021 to May 30, 2021

Variables	(Category, ***n=292***)	Number(***n=292***)	Percent
Surgery Type	Urology	80	27.4
	Gynecology	40	13.7
	ENT	32	11
	Thoracic	42	14.4
	General	54	18.5
	Neuro S.	44	15.1
Anesthesia Type	General	168	58
	Regional	124	42
Position type	Supine	153	52.4
	Lateral	51	17.5
	Lithotomy	42	14.4
	Prone	46	15.7
Position aids used	Yes	113	38.7
	No	179	61.3
Duration of surgery	< 1 hour	69	23.6
	1 – 4 hours	132	45.2
	≥ 4 hours	91	31.2

5.3 Magnitude of position related soft tissue injuries

Among total study participants, it was observed that 28(9.6%) patients developed position related soft tissue injuries. Among this, 28.6% was redness of the conjunctiva and 10.7% was lower limb skin edema. Of the 28 position related soft tissue injuries, 18(64%) occurred during general anesthesia, and 10 (36%) occurred under regional anesthesia. Supine, lateral, lithotomy and prone positions were type of positions used during the study period. Among 28 total positioning related soft tissue injuries occurred, 37% of these were developed under lateral position followed by 36%, 16% and 11% under prone, lithotomy and supine positions, respectively.

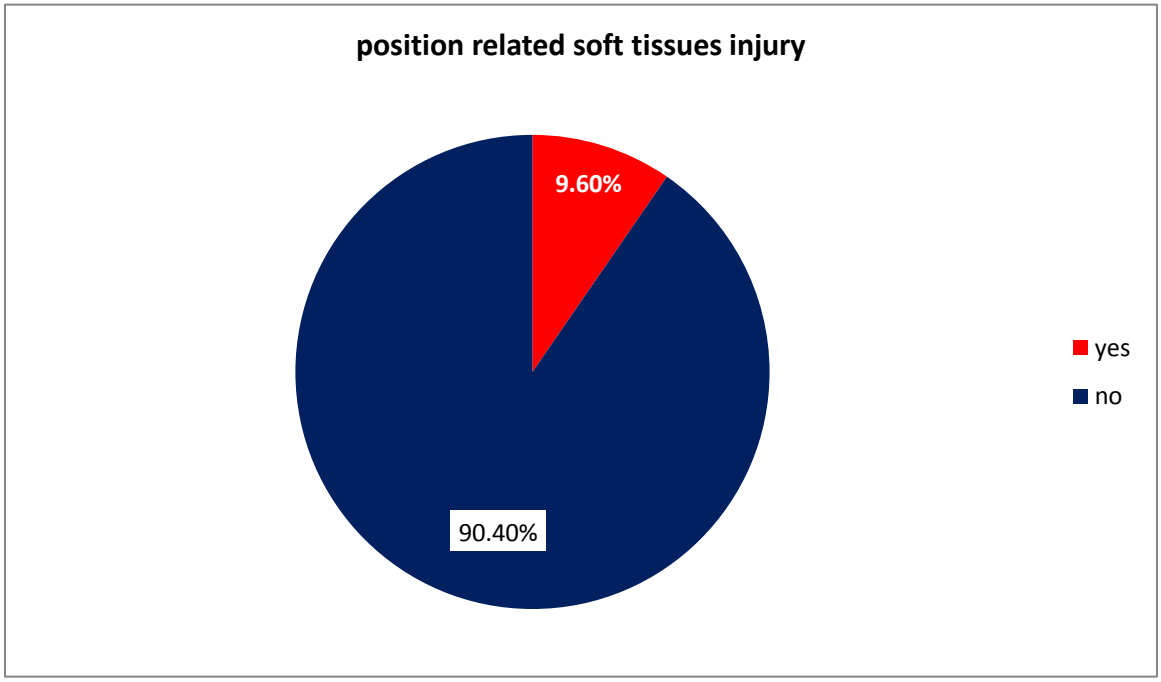

Figure 2: Magnitude of position related soft tissue injury among elective adult surgical patients in TASH, from January 1 - to May 30-2021

5.4 Factors associated with Position related soft tissue injuries

Binary logistic regression analysis was done to check the association between independent variables and dependent variable (position related soft tissue injury). According to results of bi-variable logistic regression analysis, having co-existing disease, duration of surgery >4 hours, body mass index <18.5 and >30kg/m2, type of position and non-use of positioning aids were significantly associated with position related soft tissue injury at p- value < 0.25.

Table 3: Binary logistic regression analysis results of factors associated with position related soft tissue injury among elective surgical patients at TASH from January 1. 2021 to May 30, 2021

Variables	Categories	Soft tissue injury		COR	95% CI	P-Value
		Yes (N,%)	No (N,%)			
Sex	Male	14(9.5)	134(90.5)	1		
	Female	14(9.7)	130(90.3)	1.031	.473 - 2.247	.139
Age	18 – 44	10(7.5)	123(92.5)	1		
	45 - 64	11(10.8)	91(89.2)	1.487	0.606 – 3.65	.387
	≥ 65	7(12.3)	50(87.7)	2.249	.821- 2.473	**.**115
BMI	<18.5	12(22.2)	42(77.8)	4.857	2.0- 11.75	**<.001**
	18.5-24.9	11(5.6)	187(94.4)	1		
	25-29.9	1(4)	24(96)	.708	.088- 5.73	0.746
	≥30	4(26.7)	11(73.3)	6.375	1.48-27.44	**.013**
Co-existing Disease	Yes	18(15.4)	99(84.6)	3.049	1.35- 6.870	**.007**
	No	10(5.7)	165(94.3)	1		
Type of Anesthesia	General	18(10.7)	150(89.3)	1.368	.608 - 3.077	.449
	Regional	10(8)	114(92)	1		
Type of surgery	ENT	1(3)	31(97)	1		
	Gynecology	3(7.5)	37(92.5)	0.655	.151- 2.843	0.572
	Urology	5(7)	75(93)	.162	.019- 1.413	.283
	General	7(13)	47(87)	.422	.121- 1.473	.276
	Cardiothoracic	6(17)	36(83)	.943	.292- 3.043	.922
	Neurosurgery	6(13.6)	38(86.4)	1.056	.312- 3.575	.931
Type of position	Supine	4(2.6)	148(97.4)	1		
	Lateral	11(21)	41(79)	7.220	2.337-22.302	**.001**
	Lithotomy	3(7)	39(93)	2.277	.52-9.94	.274
	Prone	10(21.7)	36(78.3)	8.222	2.65- 25.55	**P<.001**
Positioning Aids Use	Yes	7(6)	107(94)	1		
	No	21(11.8)	157(88.2)	3.202	1.42-7.21	**.005**
Duration of Surgery	< 1 hour	3(4.3)	66(95.7)	1		
	1-4 hours	6(4.5)	126(95.5)	1.048	.25-4.32	.209
	>4 hours	19(21)	72(79)	5.806	1.64-20.52	**.006**

Note: BMI = Body mass index; COR = Crude Odds Ratio; AOR= Adjusted Odds Ratio

5.5 Multivariable logistic regression Analysis Result

On multi-variable logistic regression analysis, we excluded variables which did not fit for the model using P-value >0.25 and multivariable analysis was performed for those variables including duration of surgery, body mass index, positioning aids use and type of position were associated with position related soft tissue injury. Of the interesting findings, study participants for whom positioning aids was not used for positioning during surgery had 2.24 times odds of developing position related soft tissue injury (AOR(95%CI) 2.24; 1.72 – 11.52) in contrast to those participants for whom positioning aids was used as displayed in the table below.

Table 4: Result of multivariable analysis of factors associated with position related soft tissue injury assessed at TASH, 2021

Variables	**Category**	Soft tissue injury		**COR, 95%CI**	**AOR, 95%CI**	**P-value**
		Yes (N,%)	No (N,%)			
Body mass Index	**<18.5**	12(22.2)	42(77.8)	5.61; 2.00- 11.75	6.56; 3.5- 17.54	**<.001**
	18.5-24.9	1(5.6)	187(94.4)	1		
	25-29.9	1(4)	24(96%)	1.259; .265- 5.99	.477; .052-4.4	.512
	≥ 30	4(26.7)	11(73.3)	6.4; 1.5 -27.4	6.6; .69-62.8	.101
Co-existing Disease	Yes	18(15.4)	99(84.6)	3.0; 1.35-6.5	15.0; .80- 27.4	.068
	No	10(5.7)	165(94.3)	1	1	
Position type	Supine	4(2.6)	148(97.4)	1	1	
	Lateral	11(21)	41(79)	7.22; 2.34-22.30	8.01; 1.2-30.56	**.002 ****
	Lithotomy	3(7)	39(93)	2.23; .52-9.94	2.13; .186-24.28	.543
	Prone	10(21.7)	36(78.3)	8.22; 2.64-25.5	4.48; 1.2-27.40	**.026****
Positioning aids used	Yes	7(6)	107(94)	1		
	No	21(11.8)	157(88.2)	3.202 ; 1.42-7.21	2.24; 1.72-11.52	**0.043****
Surgery Duration	< 1 hour	3(4.3)	66(95.7)	1		
	1 - 4 hours	6(4.5)	126(95.5)	1.05; .25-4.32	1.615; .14-18.8	.702
	> 4 hours	19(21)	72(79)	5.80; 1.64-20.5	5.04; 1.19-21.2	**.028 ****

****** Statistically significant P<0.05; COR = Crude Odds Ratio; AOR= Adjusted Odds Ratio

CHAPTER SIX: DISCUSSION

The main goal of this study was to assess the magnitude and associated factors of positioning related soft tissue injuries among elective adult surgical patients who underwent surgery during the study period.

According to our study, of 292 study participants, there was 9.6% overall magnitude of position related soft tissue injury (95%CI: 6.2 – 13.6). When analyzing multi-variable model of analysis, body mass index, type of position, duration of surgery and non-use of positioning aids were independently associated with development of position related soft tissue injury.

Our study finding is higher than the study conducted in Indian Krishna Institute of medical science. They conducted the study on elective urologic surgery to assess incidence of position related injuries among 292 patients. They found that the overall incidence of position related injury 2.1%. The reason for this difference may be the difference with study subjects included in the study. They included only urologic surgical cases and in our case, study subjects were from different surgical specialities.

Another retrospective study done by Bithal; et al in Riyadh, Saudi Arabia found that incidence of positioning injury was 14.7% (35). The study was done retrospectively to determine incidence of position related skin injuries among spine surgery patients operated under prone position. The difference might be estimated to be due to the difference in study period, types of surgical procedures included in the study, sample size variation and quality of intra-operative utilization of pressure relieving materials.

A one year systematic review by Mills et al in University of Virginia, USA, to determine incidence of positioning injuries among 334 elective urologic patients found 6.6% of positioning related injuries (24). The finding of this study not compared with our study result as they studied only minimally invasive surgical procedures and nerve injury was the main finding they reported, which was not covered in our study due to lack of equipment and specialist to identify the problem.

Ali et al conducted a descriptive cross-sectional study in teaching hospital of Tehran, Iran in 2020. They conducted the study with the aim of investigating postoperative skin injuries following spine surgery in prone position. They found that the magnitude of postoperative position related skin damage was 7.6% (37). This finding is in line with our finding even if their study included only neurosurgical cases and type of position assessed was only prone position and their sample size was also smaller than ours. This may be the reason why our finding is somewhat greater than their result.

Another one year prospective observational study done in Portugal on 172 elective patients of different surgical specialties reported the incidence of positioning injuries to be 12.2% (33). This study was conducted for the aim of assessing magnitude of position related soft tissue injuries and their associated factors among elective adult patients. This finding is in line with our study finding.

The finding of our study confirmed that type of position (lateral and prone) was significantly associated with development of position related soft tissue injury. It is in line with study conducted in Taipei, Taiwan University Hospital (39) to assess incidence and associated factors of position related soft tissue injury during surgical procedures in the post anesthesia care unit immediately at the end of surgery. The result of their study showed that incidence of position related soft tissue injury assessed at immediate post -operative period was 9.8% and prone and lateral positions were independently associated with development of position related soft tissue injury.

Body Mass Index is another factor associated with position related soft tissue injury and BMI <18.5Kg/m2 is shown an independent risk factor in our study. In our study, 18.5% of study participants were underweight. This finding is in agreement with a cross sectional survey done by Van Gilder and colleagues (42). Menezes et al found position related injury was significantly associated with BMI >30Kg/m2 and not with BMI< 18.5Kg/m2. The difference may be from difference in patient body distributions and genetic differences of patients.

Duration of surgery is one of the risk factors associated with development of positioning related soft tissue injury. In our study, surgery duration greater than 4 hours was seen to be strongly

associated with position related soft tissue injury. This finding is supported by the systematic review done by Haisely et al in Denmark in 2019 (40). The study conducted to assess factors associated with position related pressure injury among patients undergoing anesthesia. The reason could be explained in such that as the duration of persistent pressure applied on the localized tissue prolongs, there is limited blood supply to the area which may finally result in tissue ischemia, necrosis and skin damage. This again is supported by a number of studies done earlier (38).

In our study, non-use of positioning aids was independently associated with development of position related soft tissue injury. This finding is in-line with study done in Brazil (13). Our study also found out that lying on prone position for surgery was 4.4 times more likely at risk of developing position related pressure injury as opposed to supine position.

CONCLUSION

The main goal of our study was to assess the magnitude of position related soft tissue injury and identifying the associated factors. Magnitude of position related soft tissue injury in this study was in line with the previously reported findings in literatures. BMI <18.5, surgery duration >4 hours, lateral positioning, prone positioning and non-use of positioning aids were independent associated factors with development of position related soft tissue injury.

RECOMMENDATION

Based on the study findings, the recommendations forwarded by this study are:-

- **For Anesthesia and surgical team**

Patients those with underweight, those to undergo surgical procedures that lasts greater than 4 hours, and those indicated for lateral and prone position should be identified before surgery and all the necessary precaution should be taken.

Many literatures recommend preoperative risk assessment to identify and care accordingly for patients at higher risk to develop position related soft tissue injury during surgical procedure and we also support this should be applied in TASH operation theatres.

All necessary supplies for positioning supports during surgical procedures must be used properly by operation theatre staffs during positioning patients according to internationally accepted guidelines.

- **For the hospital management**

Adequacy and utilization of positioning support materials should be surveyed and appropriate measures should be taken on use of positioning support materials.

- **For researchers**

In some subgroups representative samples are small, so researchers are recommended to increase sample size and conduct study using this study as a base line.

It would be interesting to broadly assess the possible position related injuries uncovered in our study by following up patients in the postoperative period and analyzing the final outcome of these injuries.

Strength and Limitation of the study

- **Strength of the study**

Although the findings should be interpreted with caution, this study tried to report magnitude of position related soft tissue injury in the immediate postoperative time prospectively which will make the study to be used as a baseline for further Institutional and nationwide study.

- **Limitation of the study**

❖ Our observational study was limited to only OR set up and we did not follow patients in the ward for further findings.

❖ Representative samples are small in some subgroups. This might have effect on the outcome variable; hence, the finding of this study should be interpreted with these limitations.

❖ Since there was no exact cut off point or agreement on how to identify presence of soft tissue injury during data collection, our finding could be affected by subjective decisions.

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Annexes

Information Sheet

Title of research project: To assess the magnitude of position related soft tissue injury, and associated factors among elective adult surgical patients in Tikur Anbesa Specialized hospital at Addis Ababa, Ethiopia

Name of Principal Investigator: Tesfaye Diriba MSc student in advanced clinical anesthesia

Name of advisors: Mrs Misrak W/Yohannes(BSc, MSc in advanced clinical anesthesia and lecturer) and Mr. Biruk Tesfaye (MSc in advanced clinical anesthesia and lecturer)

Name of the Institution: Addis Ababa University, College of Medicine and Health Sciences department of anesthesia

Name of sponsor: Addis Ababa University

Purpose of the research: The main purpose of the study is to assess the magnitude of position related pressure injuries and associated factors among elective adult surgical patients at TASH. The result of the study may give some guides to develop local guideline for safe patient positioning for surgery or adopt other international clinical recommendations to reduce patieents risk of developing position related pressure injuries

Procedure of the study: Data collection was conducted in Tikur Anbessa Specialized hospital after standard questionnaire was prepared to collect all important information from patient chart, and patient observation starting from patient positioning to the end of surgical procedure.

On data collection, patients name and medical number was not taken in our questionnaire. All questionnaires kept confidential. Information collected on the questionnaires would be used only for research purpose. The study would be submitted to Addis Ababa University department of anesthesia, college of medicine and health sciences and displayed in the University's digital library. This study is also to be submitted for publication for scholarly journals.

Right to refusal or discontinue: Verification from the hospital manager and and study participant will be required to start data collection.

You are free now to raise questions related this study for clarification on my study on any issue unclear for you.

If you are voluntary to be participant of this study, please sign on the space provided.

Whom to contact: If you have any additional questions or would like to accept further information about the project, please contact

Tesfaye Diriba (Principal Investigator) Tel: +251913560511

Advisors

- Misrak W/Yohannes (BSc, MSc in clinical anesthesia)
- Biruk Tesfaye (BSc, MSc in clinical anesthesia)

Thank you for reading the information sheet and asking any questions that you might have had.

Consent Form

Addis Ababa University Department of Anesthesia

Hello, my name is _____. I am here on the behalf of Tesfaye Diriba a masters degree student in anesthesia in Addis Ababa University, school of medicine. He is conducting a research on the Magnitude of position related soft tissue injuries and associated factors among elective adult patients underwent surgery at Tikur Anbesa Specialized Hospital, Addis Ababa Ethiopia. He has received permission from Addis Ababa University school of medicine and TASH official to conduct the study.

The aim of this study is to assess the magnitude of position related soft tissue injuries and associated factors among elective adult surgical patients. The data we are going to take will help the government and stakeholders to reduce position related adverse events during & after surgery. The success of this project comes complete with your active participation. We assure you that any datum obtained from you is used only for research purposes and we guarantee your confidentiality. However, we secure your name with codes and it is free of third party exposure. You are advised to feel free to ask any questions to data collector nearby or contact the principal investigator (Tesfaye Diriba) on phone number +251-913-560-511 or email tesfudirro2010@gmail.com

Based on the understanding of the above information, do I have your permission to continue?

If yes, continue to the next page B) If no, skip to the next participant

Study participant's unique ID No_____ Signature_____ Date_____

Informed consent certified by

Name of data collector _____ signature_____

Date of data collection _____ Time started_____ Time completed_____

Result of collected data: 1. Completed 2. Participant refused 3. Partially completed_____

Supervisor (Checked): Name_____ Signature_____ Date_____

Section 1: Data collection Questionnaires

Instruction: For each of the questions, please circle the letter of alternative(s) that fit the response or fill the blank space provided.

Section 1.1: Questions for socio- demographic factors

1. Age (in years) _____

2. Gender

1. Male 2. Female

3. Height in cm _____

4. Weight in Kg _____

5. Body mass index (kg/m2) _____

Section 1.2: Questions at the preoperative period

6. Does the patient have any pre-existing disease?

1. Yes

2 No

7. If answer to Q6 is yes, which of the listed below?

1) Hypertension

2) Diabetes Mellitus

3) Renal disease

4. Peripheral vascular disease

5) Other…….

8. What is type of surgery?

1) Urology

2) Gynecology

3) Neurosurgery

4) Cardiothoracic

5) GI & General

6) ENT

Section 1.3: Questions during the intra operative period

9. What type of anesthesia used?

1. General anesthesia
2. Regional anesthesia

10. What surgical Position was used?

1. Supine
2. Prone
3. Lateral
4. Lithotomy

11. Is there any positioning aids used?

1. Yes
2. No

12. If answer to Q12 is yes, which of the listed below?

1. Prone foam headrest
2. Leg stirrups
3. Arm boards
4. Foam pads
5. Axillary roll
6. Saline bags

13. Length of surgical procedure (in hours)

1) < 1 hour 2) 1 hour to 4 hours 3) >4 hours

Section 4: Questions at the postoperative period at PACU

14. Are there **any position related injuries**?

1. Yes
2. No

15. If answer to Q 15 is yes, please identify_____