POSTOPERATIVE PAIN RELIEF IN ADULTS: A COMPARISON OF TWO ROUTES OF ADMINISTERING PETHIDINE IN ABDOMINAL SURGERY-

A DISSERTATION SUBMITTED TO THE NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA IN PART FULFILMENT FOR FMCS FINAL EXAMINATION, NOVEMBER 1998.

BY

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DECLARATION

I do hereby declare that the work presented here, titled: "Post operative pain relief in adults, a comparison of two routes of administering pethidine in abdominal surgery", is original and was done by me at the Department of Surgery Ahmadu Bello University Teaching Hospital Zaria, under the appropriate supervision and it has not been submitted in part or in full for any other examination or publication.

LAZARUS M.D. YUSUFU.

DEDICATION

To my wife, Deborah, and my parents, Deacon and Mrs Y.M. Mungu.

CERTIFICATION

This is to certify that this project, titled: POSTOPERATIVE PAIN RELIEF IN ADULTS: A COMPARISON OF TWO ROUTES OF ADMINISTERING PETHIDINE IN ABDOMINAL SURGERY, was carried out in the Department of Surgery Ahmadu Bello University Teaching Hospital Zaria, by Dr L.M.D. YUSUFU, and supervised by us.

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SUMMARY

This is a prospective study of postoperative pain management in 112 consecutive patients admitted into the department of surgery of Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, for abdominal operations over a twelve-month period, April 1st 1995 to 31st March 1996. This represents (11.02%) of all operations performed by the department during the study period.

There were two groups of patients (Group A and Group B). The patients in both groups were matched for age and weight and were selected by ballot. Group A patients were given pethidine 25mg intravenously as bolus and Group B patients lOOmg intramuscularly. Pain and pain relief were assessed by nominal scores.

The incidence of postoperative pain was 100%, with majority of patients rating their pain as either moderate or severe. Group A patients had significantly better pain relief than their counterparts in Group B.

Fifty-one of the fifty-six patients (94.6%) in Group A were satisfied with their pain relief compared with forty-two of the fifty-six (71.4%) of patients in Group B. The difference was statistically significant.

Side effects of pethidine were recorded in 37.5% and 26.8% of patients in groups A and B respectively, with no statistical significance.

Postoperative pain was not significantly related to age, sex of the patient or duration of operation.

POSTOPERATIVE PAIN RELIEF IN ADULT: A COMPARISON OF TWO ROUTES OF ADMINISTERING PETHIDINE.

INTRODUCTION.

Postoperative pain is that unpleasant experience which a patient goes through as a result of a surgical operation.[1-6] Acute postoperative pain is caused by an incision and its consequences.[7]

The quest for the best method for the relief of postoperative pain poses one of the most common problems experienced in hospital practice. Drugs administered for the relief of postoperative pain constitute the second most common prescriptions after antibiotics.[7,8]

Severe postoperative pain limits effective coughing, impairs the ability to sigh and to breathe deeply especially in thoracic and upper abdominal operations.[9]

When postoperative pain is not relieved, it leads to delayed postoperative recovery, increased morbidity and mortality, slower patient turnover in hospitals and loss of work days.[10]

Effective postoperative pain relief improves and reverses the adverse effects of surgery on pulmonary mechanics, thus decreasing operative morbidity and mortality.[9,10-13]

Parenteral administration of narcotics is the commonest mode of treating postoperative pain.[7,10,14,15] It may be administered intravenously, intramuscularly or subcutaneously.[10]

Pethidine is the commonest drug used for postoperative pain relief in Ahmadu Bello University Teaching Hospital Zaria. This study is designed to compare the efficacy of pethidine in the

relief of postoperative pain administered by the intravenous and intramuscular routes.

LITERATURE REVIEW

Historical review

Twycross[2] noted that Aristotle more than 2000 years ago described pain together with pleasure as " a passion of the soul." "pain is what hurts the patient."[2]

The fundamental aim of medical art and science has always been the alleviation of pain and suffering.[11]

Postoperative pain had earlier been erroneously considered to be of low priority in surgical practice, because it did not cause death directly.[16] However, it can cause postoperative pulmonary complications, by inhibiting deep breathing and cough.[16]

The interpretation of postoperative pain varies from person to person, and is a result of the interplay of biological, psychological and environmental factors.[4]

Almost all surgical operations are painful[7,16] Surgical pain is most severe when it involves thoracotomy and laparotomy.[10,12]

In ancient times surgeons used alcohol, opium and phlebotomy to reduce postoperative pain.[17,18]

Assessment of pain

No standard method of assessing postoperative pain has been universally agreed upon. This is because pain is a subjective experience, and it is difficult to make reliable assessment of its intensity.[4,7,11,19-21] There are various methods for assessing postoperative pain however, and these are useful in clinical practice and research.[21]

These may be broadly classified into two methods.[3,7,11,12,21]

i. Uni-dimensional scales.

ii. Multidimensional scales.

Uni-dimensional scales include verbal rating scale (VRS), visual analogue scale (VAS) and simple visual chromatic scale (SVCS). The patient is asked to describe the severity of the pain. In its simplest form the patient is asked whether there is pain or not.

Visual Analogue Scale (VAS), is now being used widely as a sensitive measure of pain intensity. It is a 10cm long ruler, with increments from 0-100. The numerical analogue scale has 10 equal increments (0-10) and the patient marks with an X the intensity of pain at present. Zero point represents no pain, while the other end, 10 point represents unbearable pain. A further simple numerical scale is the five point verbal analogue scale, with this method the patient may choose from five words to describe varying intensity of pain experienced:- None, scarcely any, moderate, severe and very severe. The scales have to be explained to the patients by the doctor before a reliable result can be obtained.[7]

The description is only defined in one dimension, nevertheless the scales have a good applicability, validity and correlation with multidimensional measurement instruments. Simple visual chromatic scale (SVCS), is a simple method of assessing pain and it is based on the use of colours, which are familiar to the patient. With SVCS pain is rated as none, mild, moderate or severe using different colours to connote different intensity of pain. This has been shown to have the best correlation with visual analogue scale, and acceptable degree of variation between individuals.[7,11]

The McGill[5,11] pain questionnaire is an example of the multidimensional scale. It is cumbersome, and assesses pain under three dimensions:- sensory, affective and emotional aspect. It is used commonly in research and in chronic painful states. It exists in both a long and short form. The original form contained 78 adjectives which the patient could choose from to describe experience of pain. The short form comprises 15 adjectives mainly in the sensory and affective aspects.[7] (Appendix III) The patient can estimate the quantity of pain by three grades of intensity. Other methods of assessing postoperative pain are those described by Keele, and Sriwatanakul.[19,20] Sriwatanakul et al attached scores on the ordinal scale (0,1,2,3) to the descriptive pain terms.

Verbal analogue scale

Ordinal scale	Pain
0	None
1	Slight
2	Moderate
3	Severe

Most workers use the objective or subjective approach to assess postoperative pain.[22,23]

Assessment of pain relief.

The assessment of postoperative pain relief is difficult, and various authors have used different methods.[4,24-27] The efficacy of treatment of postoperative pain, may be measured by pain intensity difference (PID), which is the difference in intensity

of pain before and after administration of an analgesic over the study period.[11]

Pain relief score may be used to assess the treatment of postoperative pain.[27]

Pain relief score.

Score	Pain relief
0	No relief
1	Slight relief
2	Moderate relief
3	Complete relief

Pathophysiology of postoperative pain

Many theories of pain have been put forward, for example, specific theory, pattern theory and modulation (gate control) theory.[4,6,10,11,28-37]

Specific theory, maintains that pain is a specific stimulus perceived by special receptors that make special connection in the central nervous system. Pain travels along thick myelinated, fast conducting A-delta fibres, and along thin, unmyelinated slow conducting C-fibres, producing respectively immediate short and delayed persistent responses. These fibres synapse with neurones on the substantia gelatinosa in the dorsal horn of the spinal cord. The second-order neurones cross the midline in the white commissure and ascend in the lateral spinothalamic tract to reach the posterolateral ventral nucleus of the thalamus, where they are relayed via third-order neurones to the postcentral gyrus of the cerebral cortex.[4]

Pattern theory, suggests that afferent neurones carry all kinds of impulses impartially and that the pattern of impulses are programmed in the spinal cord and interpreted by the brain. Certain spatiotemporal patterns are perceived as pain after intense stimulation of non-specific receptors.[4]

Modulation theory, Melzack and Wall proposed the existence of input control in the substantia gelatinosa which operates as a gate. Persistent intense high threshold impulses carried by the C-fibres (perceived as severe pain) can be blocked if a "gate mechanism" in the dorsal horn first closed by faster low threshold pain impulses carried by A-delta fibres or by modifying impulses descending from the brain, for example those initiated by stress or emotion. This theory explained combat analgesia and pain relief in acupuncture.[4,10]

The tissue damage resulting from surgical operations, provide a series of noxious stimuli that generate nociceptive impulses.[32,33] The tissue injury persists after a surgical operation and pain producing substances having been released, reduce the high threshold of nociceptors, so that innocuous stimulation produces pain.[31,32] These impulses are fed into the central nervous system and produce segmental, suprasegmental reflex and cortical responses that result in the experience of postoperative pain.[32]

The segmental reflex responses are the result of hyperactivity of anterior and anterolateral (motor) cells. These consist of skeletal muscle spasm, vasospasm and reduced gastrointestinal activity. The muscle spasm and vasospasm give

rise to more pain by acting as a source of noxious stimulus and ischaemia respectively.[32]

The suprasegmental responses consist of alteration of ventilation, circulation and hypothalamic hyperactivity with consequent widespread neuroendocrine stress response.[32,35]

The cortical responses consists of sensation of pain and voluntary muscle responses.[31,32] Postoperative pain is different from other types of pain, in that it is usually transitory, and improves with time.[30]

It is apparent that unless postoperative pain is relieved, the stage may be set for various complications in the postoperative period.[32] Postoperative complications may occur as a direct or indirect result of postoperative pain.[9] Atelectasis and pneumonia with ventilation-perfusion abnormalities may follow operations in the thoracic and abdominal regions.[9,10]

The fear of aggravating postoperative pain causes the patient to be inactive, and suppresses the urge to breathe deeply or cough.[32] Physical inactivity caused by postoperative pain may lead to thromboembolic processes.[31,34] These in turn may lead to serious consequences, such as infarction of vital organs and increased morbidity and mortality.[10]

Postoperative pain may be influenced by the physiological and psychological make up of the patient, the site and nature of the operation, and the amount of surgical trauma.[5,20,24,30,32,37] An operation with extensive tissue dissection will produce more pain than one with minimal tissue dissection.[34,35] The signs of pain include restlessness, tachycardia, sweating, pallor and hypertension.[14]

Infants, children and elderly patients seem to tolerate postoperative pain better than young adults.[5,32]

Control of postoperative pain

There are many methods of postoperative pain control.[4,9,11,21,32,35,38-47]

1. Conventional administration of opioids intramuscularly.
2. Newer opioid agonist/antagonist drugs.
3. Newer parenteral routes of administration of opioids.
   a) Bolus intravenous administration.
   b) Continuous intravenous administration.
   c) Patient controlled analgesia (PCA).
   -Bolus; intravenous, intramuscularly or subcutaneous.
   -Bolus plus infusion; intravenous, intramuscularly or subcutaneous.
4. Non-parenteral administration of opioid by:-
   -Sublingual, oral, rectal, transdermal and transnasal routes.
5. Local anaesthetic techniques.
6. Subarachnoid and Extradural opioids.
7. Respiratory route of administration of volatile/gaseous agents.
8. Non-pharmacological methods
   -Cryotherapy.
   -Transcutaneous electrical nerve stimulation (TENS).
   -Acupuncture.
   -Psychological methods.
9. Others are:-Non-opioid, balanced and preemptive analgesia.

The various methods of controlling postoperative pain have advantages and disadvantages.[32,35,46,47]

Conventional administration of opioids intramuscularly on an intermittent basis is the method commonly used for prescribing postoperative analgesia.[11,21] Morphine and its derivatives are some of the drugs used for the relief of postoperative pain, because of availability and low cost.[5,6,25] Administered opioids produce analgesia via specific opioids receptors with differing patterns of action.[6,34] Their effects include analgesia, euphoria, respiratory depression, nausea, vomiting and meiosis. The gastrointestinal tract tone is increased but the motility is decreased. Opioids cause histamine release, which results in urticaria and itching locally while bronchial constriction and hypotension results systemically. The rate of onset and intensity of analgesia are related to the route of administration, being greatest with intravenous injection and least with oral or rectal routes.[8,12,21,32,35]

Pethidine generally has a lower analgesic efficacy than morphine.[6,21] It has many similar properties with morphine though naturally dissimilar, being a synthetic opioid agonist.[6,25,34] The advantages of intramuscular administration of opioids are simplicity, familiarity to the users, gradual onset of side effects and it is economical.[11,21,32,35] The disadvantages of intramuscular opioids include delayed onset of analgesia, fluctuating plasma concentration of the drug and pain at injection site.[21,25,35] Bolus intravenous administration of opioids for the relief of postoperative pain is common in recovery rooms.[35] This route offers the advantage of immediate and

reliable uptake of the drug by the systemic circulation with rapid onset of action.[21] The quality of post=operative pain relief may be improved by giving small incremental doses of the drug intravenously.[31,37] The main problem is the narrow safety margin between adequate pain relief and side effects..[21,35]

Naloxone is used mainly to treat side effects of opioids especially respiratory depression as a result of overdose. It is a competitive opioid antagonist or receptor blocker with a short duration of action. It produces rapid reversal of the effects of morphine and other opioids. The respiratory depressant effect of these drugs are antagonised before the analgesic effect.[6,34]

Patient controlled analgesia (PCA) equipment comprises an accurate source of infusion coupled to an intravenous cannula and controlled by a patient-machine interface device. With PCA the patient determines the rate of administration of the drug.[35] Safety measures are incorporated to limit the preset dose, the number of doses, and the "lock-out" period between doses. The Cardiff Palliator is the first commercially available used with pethidine.[10,35]

Non-parenteral opioid administration, has been used to relieve postoperative pain. Buprenorphine is used sublingually to provide good analgesia, it requires cooperation, and it is convenient to the patient and the nursing staff.[35] Oral opioids may be used in the late postoperative periods. The rectal use of opioids administration avoids the problem of reduced gastrointestinal motility. Fentanyl is used transdermally because of its high lipid solubility and high potency, to provide effective plasma concentration. Fentanyl is used for

postoperative pain relief, by incorporating it into a system that delivers a certain dose per hour via a patch applied on the skin.[41]

Local anaesthetic techniques may be used to provide analgesia in the early postoperative period. The main disadvantage is the short duration of action except for bupivacaine.[10] Adrenaline may be added to prolong the blockade. The most effective means of prolonging the block is by the use of a catheter to permit either repeated bolus doses or a continuous infusion of the local anaesthetic.[4] The most commonly used blocks for postoperative pain are spinal nerve block, extradural block, caudal block and regional nerve block.[4,10,35]

Opioids have been administered via intrathecal and extradural routes, following the demonstration of opioid receptors in the central nervous system and the spinal cord. The subarachnoid route is less popular than the extradural route because of spinal headache. The extradural route of administration of opioids results in prolonged analgesia. Analgesia may be produced without motor or autonomic block produced by local anaesthetics.[35,43] Opioid side effects occur with these routes of administration also, and include respiratory depression, itching, nausea and vomiting, which can be reversed by naloxone.[5,35,43,44]

Sub-anaesthetic doses of inhalation substances such as trichloroethylene and nitrous oxide provide analgesia. Nitrous oxide and trichloroethylene have been used for postoperative pain relief.[5,45] These agents possess good analgesic properties in addition to their anaesthetic actions. Entonox is a mixture of

nitrous oxide and oxygen used for postoperative analgesia in minor surgical procedures and physiotherapy and it is administered by the patient.

Balanced analgesia or multimodal analgesia is a concept of achieving pain relief, that involves the use of a number of drugs with different mechanisms of action in reduced dosages. The analgesia achieved is maximised and side effects of each drug reduced.[7,36-38,48-50] The combination of non-steroidal anti-inflammatory drugs, opioids, and local anaesthetics is an example. This followed the realization that attempts to produce total analgesia with a single technique (unimodal) are likely to be associated with major side effects.[49-52]

Preemptive analgesia, aims to eliminate or reduce acute pain if the continuous afferent barrage is prevented from reaching the central nervous system by pre-injury neural block with local anaesthetics. The excitability of the central nervous system may also be suppressed with opioids before it receives a nociceptive input. The opioids also prevent central sensitization and secondary hyperalgesia.[49-55] This concept is based on the background that tissue injury results in disruption of the normal specialization of the central nervous system, with alterations in the processing of afferent stimuli.[31,49] The intensity and maintenance of postoperative pain is dependent on central hyperexcitability and continuous afferent barrage from the wound.[52] Preemptive analgesia reduces the incidence of postoperative pain.[11,21]

The traditional management of postoperative pain is the prescription of a standard dose of an opioid intramuscularly, to

be given by a nurse.[35,37,44,56,57] The current trend is towards balanced and preemptive analgesia, and the establishment of acute pain teams, who are charged with the responsibility of treating postoperative pain.[21,37,39,49,55]

AIMS OF THE STUDY

1. To ascertain the severity of postoperative pain.
2. To compare the analgesic effects of small-dose intravenous with large-dose intramuscular pethidine for the relief of postoperative pain.
3. To find out the effect of age, sex, of the patient, and the duration of operation, on postoperative pain.

PATIENTS AND METHODS.

PATIENTS

This is a prospective study, for one year, between 1st April, 1995 and 31st March, 1996.

Surgical patients admitted into the Department of Surgery, Ahmadu Bello University Teaching Hospital Zaria, for elective or emergency abdominal operations using midline incisions were studied.

Each patient was studied within the first 48 hours after operation, and followed up until discharge from hospital.

All the patients had routine clinical assessment and preparation for surgery.

To be included in the study the patients had to meet the following criteria:-

- To give consent.
- Be above 18 years.
- Must remain in the hospital for at least 48 hours after operation.
- Have adequate level of consciousness.
- Not be on any drug with hypnotic or analgesic effect.

Those excluded from the study were;

- Those who had previous abdominal operations.
- Those who did not satisfy the above criteria.

All prospective patients who satisfied the criteria for the study were interviewed. The aims and objectives of the study were explained to each patient, and were immediately assigned to Group A or B by ballot, and other analgesics or hypnotics withheld until the study period.

Premedication with 0.6mg atropine was given shortly before induction. Endotracheal anaesthesia was induced with sodium thiopentone (4.5mg/kg) and maintained by a mixture of halothane, oxygen, and nitrous oxide. Some patients were paralysed and the ventilation controlled. Narcotic or analgesic drugs were not given intraoperatively, so as to standardize the procedure and to obtain a correct pain score.

The patients were asked to quantify their pain after recovery, from anaesthesia using the nominal pain score. Pethidine was then administered and the time recorded. Patients were then asked to quantify the relief of their pain hourly within the first 6hours following the initial administration of pethidine using the pain relief score.

Group A patients received pethidine 25mg diluted to 2mls intravenously every 4hours, 50mg/8hours and Group B patients received pethidine 100mg intramuscularly every 8 hours through the gluteal region. The patients were asked to quantify their pain and pain relief, using the scores below.

Nominal pain score		Pain relief score	
Pain	Score	Pain relief	Score
No pain	0	No relief	0
Mild pain	1	Mild relief	1
Moderate pain	2	Moderate relief	2
Severe pain	3	Complete relief	3

These methods were easily understood by the patients and easy to administer. The time of assessment and administration of

pethidine were recorded. The biodata of the patients were also recorded and the duration of operation, as per the proforma. All the data were collated by the author. The patients' vital signs and any side effects following administration of pethidine were recorded at each assessment. The author was actively involved in the management of all the patients studied.

The data collated were analysed with the help of a Zenith Model 386 computer. The application package used for the analysis was Epi Info version 5. The statistical significance of the differences observed were determined by Chi-Square (X^2) Test. A p-value of 5% or less was considered significant.

SCOPE AND LIMITATIONS

SCOPE

1. This is a prospective study over a twelve month period, from 1st April 1995 to 31st March 1996.
2. The patients studied were those who presented as emergency or elective cases.

LIMITATIONS

1. The lack of functional facilities to measure serum levels of pethidine militated against correlating pain relief and the serum level of pethidine.
2. The difficulty of an objective method of assessing pain experience may affect the study.

RESULTS

There were a total of 112 patients, 95 males, 17 females with a mean age of 48.64 years (range 18-85 years), in the study period. (table 1).

Table 1 Age distribution of patients

Age (years)	Group A	Group B	Both groups
15-19	2	1	3
20-29	9	9	18
30-39	12	10	22
40-49	5	6	11
50-59	3	9	12
60 and above	25	20	45
Total	56	56	112

The incidence and severity of postoperative pain in the two groups is shown in table 2. All the patients experienced pain after operation and the majority of them had moderate or severe pain.

Table 2 Incidence and Severity of Postoperative Pain in the two groups.

Percentage (%)	Group A	Group B
Incidence of pain	100	100
No pain (0 score)	0	0
Mild pain (1 score)	1.8	0
Moderate pain (2 score)	10.7	23.2
Severe pain (3 score)	37.5	76.8

Most of the operations performed were via lower midline and combined midline (upper and lower midline) incisions as shown in table 3.

Table 3 Operations and incisions performed for the two groups

Surgery	Incisions	Number	Total
Hellar's operation	Upper midline	1	10
Vagotomy + pyloroplasty	Upper midline	9	
Laparotomy	Upper and lower midline	37	50
Gastrectomy	Upper and lower midline	5	
Splenectomy	Upper and lower midline	2	
Nephrectomy	Upper and lower midline	2	
Cholecystectomy	Upper and lower midline	4	
Suprapubic cystostomy	Lower midline	18	52
Transvesical prostatectomy	Lower midline	34	
Total		112	112

Table 4 shows that in group A, almost all the operations were performed via combined (upper and lower) midline and lower midline incisions.

Table 4 Operations and incisions performed for group A

Surgery	Incisions	Number	Total
Hellar's operation	Upper midline	1	5
Vagotomy + pyloroplasty	Upper midline	4	
Laparotomy	Upper and lower midline	19	27
Gastrectomy	Upper and lower midline	3	
Splenectomy	Upper and lower midline	2	
Nephrectomy	Upper and lower midline	1	
Cholecystectomy	Upper and lower midline	2	
Suprapubic cystostomy	Lower midline	8	24
Transvesical prostatectomy	Lower midline	16	
Total		56	56

The majority of the operations in group B were performed via combined (upper plus lower) midline and lower midline incisions as shown in table 5 below.

Table 5 Operations and incisions performed for group B

Surgery	Incisions	Number	Total
Hellar's operation	Upper midline	-	5
Vagotomy + pyloroplasty	Upper midline	5	
Laparotomy	Upper and lower midline	18	23
Gastrectomy	Upper and lower midline	2	
Splenectomy	Upper and lower midline	-	
Nephrectomy	Upper and lower midline	1	
Cholecystectomy	Upper and lower midline	2	
Suprapubic cystostomy	Lower midline	10	28
Transvesical prostatectomy	Lower midline	18	
Total		56	56

The mean pain score and operation time were more in group A. Satisfaction with pain relief and the frequency of pethidine side effect were also more in group A than in group B as shown below.

Table 6 Comparison of the two groups

	Group A (n=56)	Group B (n=56)
Mean pain score	2.89±0.3	2.79±0.4
Mean op time (minutes)	99.64±17.6	96.88±17.2
Satisfaction with pain relief	94.6%	71.4%
Frequency of side effects	37.5%	26.88%

Op = operation.

The improvement in vital signs 1 hour after pethidine injection, was more in Group A, but differences were not statistically significant (table 7).

Table 7 Mean respiratory, pulse rate and systolic blood pressure

	Before pethidine			After pethidine		
Group	R.R	P.R	S.B.P	R.R	P.R	S.B.P
A	26.1	88.7	128.9	20.9	75.7	114.2
B	25.4	86.8	122.5	21.0	80.3	115.2

P>0.05

RR =respiratory rate per min, PR= pulse rate per min,

SBP= systolic blood pressure in mmHg.

Table 8 shows the mean pain score by age. Postoperative pain decreased as the age of the patient increased.

Table 8 Pain score by age

Age (years)	Mean pain score	
	Group A	Group B
15-19	3.00	3.00
20-29	3.00	2.88
30-39	3.00	2.70
40-49	2.80	2.83
50-59	3.00	2.80
60+	2.80	2.66
18-40	3.00	2.77
41-59	2.88	2.80
60+	2.80	2.71

For both groups A and B patients, postoperative pain was more in the females than in the males as shown in table 9.

Table 9 Pain score by sex

	Group A			Group B		
Pain score	Male	Female	Total	Male	Female	Total
1	1	0	1	-	-	-
2	6	1	7	12	1	13
3	40	8	48	36	7	43
Total	47	9	56	48	8	56
Mean	2.82	2.88		2.75	2.88	

Table 10 shows that postoperative pain increased as the duration of operation increased in both groups.

Table 10 Pain score by duration of operation

	Group A			Group B		
	Time in minutes					
Pain score	0-60	61-120	>120	0-60	61-120	>120
1	0	1	0	-	-	-
2	2	4	0	2	11	0
3	3	41	5	2	40	1
Total	5	46	5	4	51	1
Mean	2.60	2.86	3.00	2.50	2.78	3.00

Group A patients had higher pain relief scores initially, that decreased more rapidly with time than group B patients. This resulted in peaks and troughs in the pain relief as shown in figure 1. Patients in group B had lower pain relief, but sustained, and the decrease with time was more gradual than in group A patients.

The majority of patients in both groups did not report any side effect following pethidine administration. The commonest side effect reported in both groups were nausea and vomiting as shown in figures 2a and 2b.

Figure 1

Mean pain relief score in the two groups

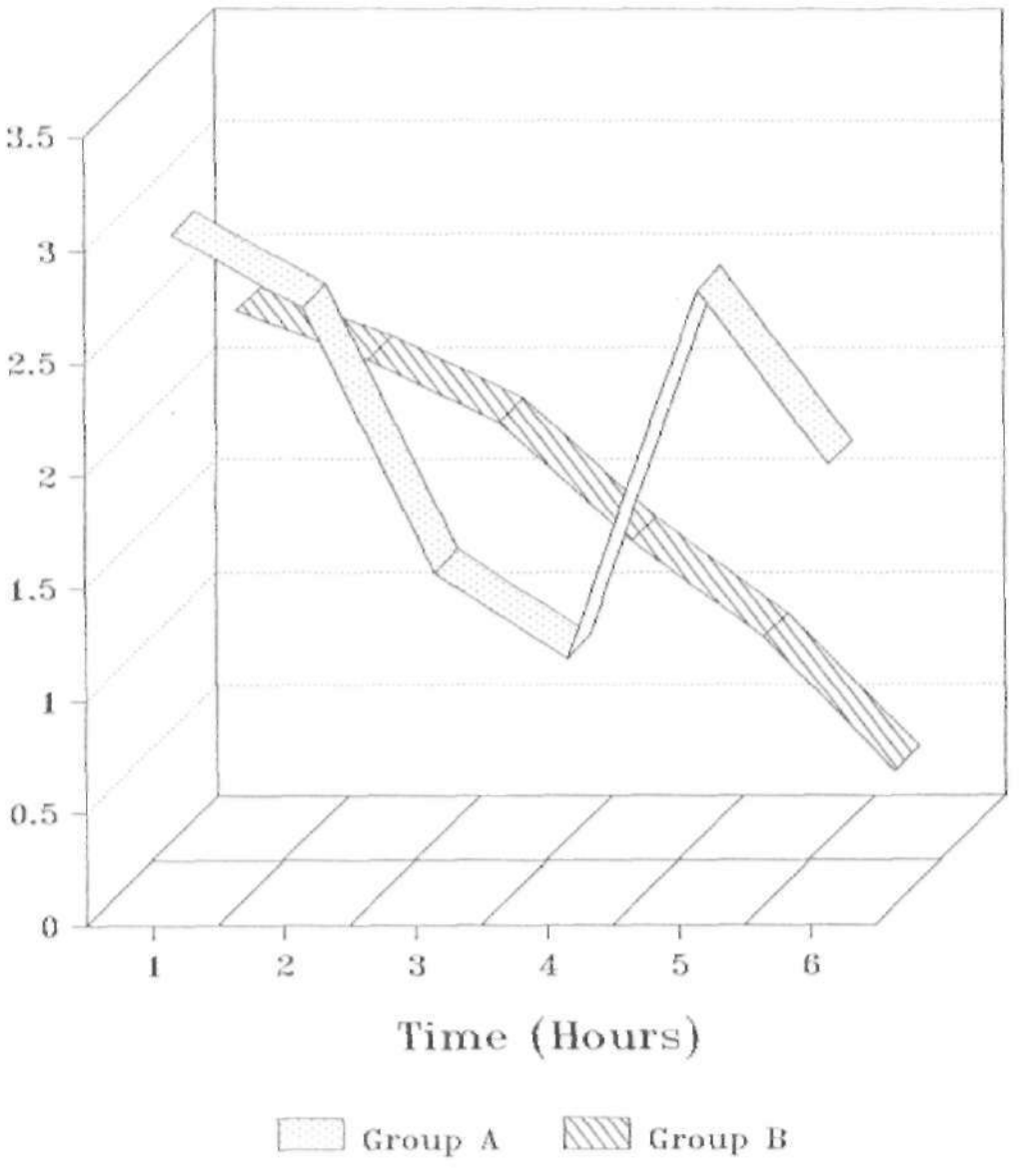


Figure 2a

Side effects of pethidine in group A

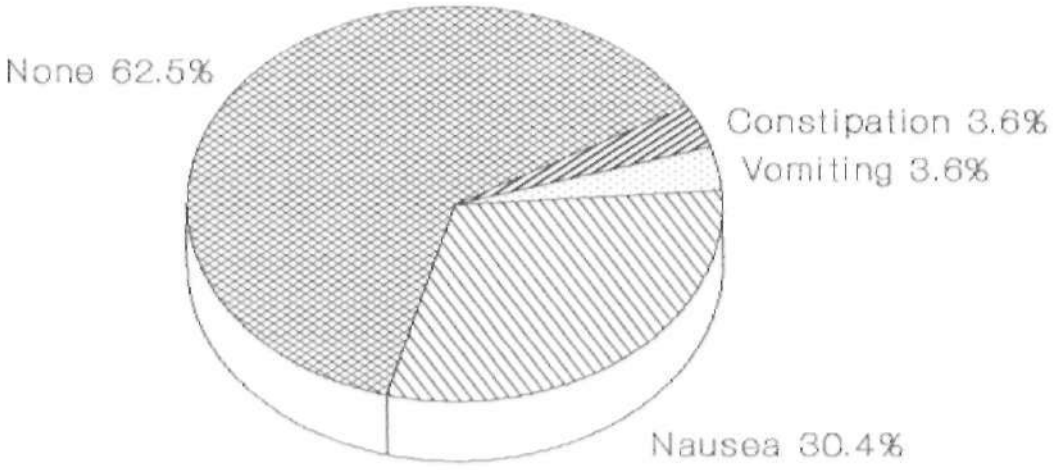
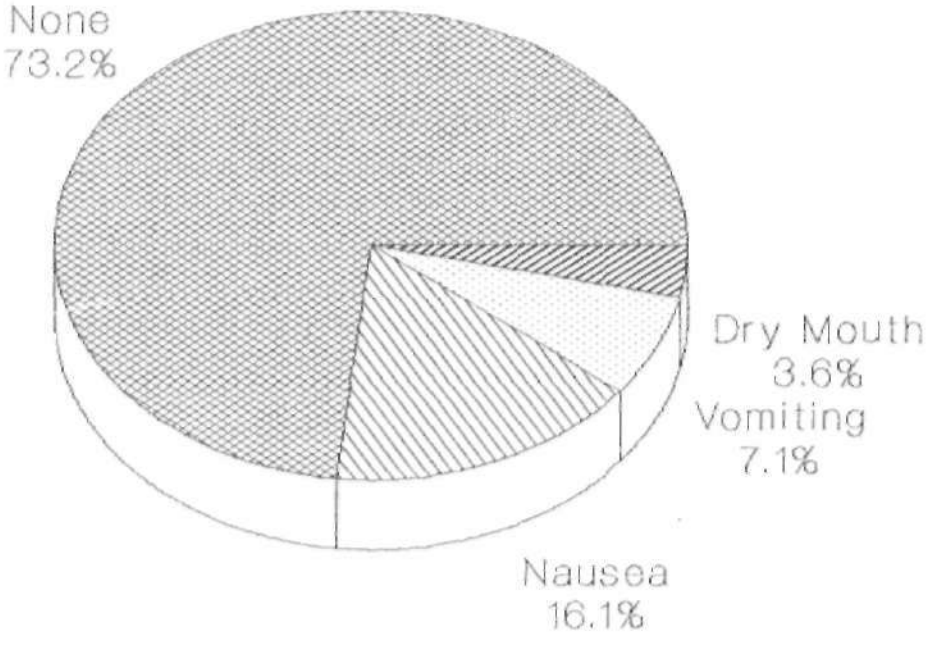


Figure 2b

Side effects of pethidine in group B



DISCUSSION

The provision of postoperative pain relief has undergone major improvements in the last two decades. This has been as a result of better understanding of the neurophysiological basis of postoperative pain. This understanding has also improved the methods of organisation and techniques of analgesic delivery.[43,55]

There were 45 patients 60 years and above of the 112 studied, also a male predominance with a male to female ratio of almost 6:1. This is explained by the large number of urologic operations performed. The indications for these urologic operations, are common as the male patient advances in age.

Most of the incisions performed were lower midline and combined (upper plus lower) midline in both groups. This is also explained by the type of surgical conditions that were seen. Almost half of the total number of patients were operated upon for urologic conditions.

Postoperative pain management with intravenous pethidine resulted in better and immediate pain relief, than with intramuscular pethidine. The patients in group A, reported more satisfaction with their pain management as compared to those in group B. The better and immediate pain relief in group A, may have resulted from the better analgesic effect of the pethidine administered by the intravenous route. This is because the intravenously administered pethidine rapidly binds to the opioid receptors in the brain almost immediately and achieve faster equilibrium between receptor drug concentration and plasma concentration and thus act faster and reliably, than the intramuscular pethidine. Pethidine administered by the

intramuscular route results in a slow and unreliable absorption especially in patients with hypothermia, hypovolaemia or hypotension.[5] The intramuscular pethidine may also be inadvertently injected into the subcutaneous tissue or fat thus contributing to its poor pain relief.

In the first two and a half hours after operation, pain relief was better in group A. The maximum pain relief was within the first one hour after pethidine injection in both groups. The duration of effective analgesia was shorter in group A being only two and a half hours, compared with four hours in group B (figure 1), taking pain relief score of 1.5 as the effective level of pain relief. This is not surprising.

Pflug and Bonica,[42] reported better pain relief by intravenously administered pethidine than intramuscular route. They also observed that intravenous narcotics resulted in effect that lasted a duration of two and a half hours after initial administration. This is also consistent with the findings of Kay and Catling, Pinto, Jordan et al.[56,57]

The mean pain relief score in group A was higher than in group B. This may be explained by the rapid onset of action and plasma clearance of the intravenously administered pethidine. This route may however result in a pattern of peaks and troughs in the control of pain.[1,11,12,21,37,45] Further evidence of better pain relief in group A is shown by the more stable vital signs one hour after pethidine administration than in group B. Pflug and his Bonica[42] had proposed that it was probably best to give narcotic analgesics intravenously and slowly, in order to titrate carefully to the patient's needs. Small doses are given at short

intervals, until the desired result is achieved. This method reduces to a great extent the total consumption of narcotic drugs for surgical patients.[12,13,32,35] It was observed in this study, that the total drug consumption per patient in the intravenous group was half that of the intramuscular group. This is similar to what Nayman,[12] Kamel and Geddes reported.[32]

In both groups, side effects following pethidine administration were not common. The commonly observed side effects were nausea and vomiting. This is similar to the findings of both Kamel, Geddes[32] and Paymaster.[5] The slightly higher frequency of side effects in group A may be due to the route of administration of the drug, which delivers the drug directly into the circulation. The intramuscular route of administration results in a delayed and variable absorption, and may account for the lower incidence of pethidine side effects. Catling, Pinto, Jordan et al,[37] reported more side effects in the group that had papaveretum administered intravenously than the intramuscular group. The incidence of nausea and vomiting in this study is similar to that reported by Fry,[13] and Kay.[36]

Despite the fact that no patient required treatment for the nausea or vomiting in this study, the need for treatment may arise in some patients. The commonest cause of postoperative nausea and vomiting is the administration of opioids either intraoperatively or in the postoperative period.[38] Postoperative nausea and vomiting (PONV) is unpleasant and aesthetically displeasing to both the patients and their caretakers. It is associated with detrimental effects, such as oesophageal tears, gastric herniation, muscular fatigue and aspiration of vomitus.

It can cause tension on sutures, bleeding at operative sites, fluid and electrolyte imbalance and wound dehiscence all of which prolong recovery and hospital stay.[56,57] There are several types of antiemetics used in the management of PONV. Gastrointestinal prokinetic drugs with antidopaminergic actions, for example metoclopramide, and domperidone, are antiemetics. Phenothiazines, example prochlorperazin, perphenazine and butyrophenone (droperidol), have antiemetic properties also. Central anticholinergic action seen with hyoscine, atropine and some antihistamine receptor type 1 antagonists (cyclizine) is associated also with antiemetic activity. It may be that the anticholinergic effects of these drugs are responsible for their antiemetic activity.[58] The side effects of these drugs have led to the introduction of serotonin antagonists. The five-hydroxytryptamine subtype 3 receptor antagonist represent a major advance in the management of postoperative vomiting as they are highly effective and possess a low side effect profile. Examples include granisetron, tropisetron, batanopride, zacopride and ondansetron.[59,60] Propofol is associated with a markedly decreased incidence of PONV. This followed its introduction into the anaesthetic practice in 1982, for both the induction and maintenance of anaesthesia.[61] Midazolam has also been used to treat persistent PONV.[62]

Postoperative pain in this study decreased as the age of the patient increased. The patients that were 60 years and above reported the least pain in both groups. It is not that elderly patients do not perceive pain, but generally they react less to postoperative pain, perhaps as a result of psychological

preparation during the pre-operative period.[5] This may be enough to activate psychodynamic mechanisms that in turn, stimulate supraspinal inhibitory influences that "close the gate" and prevent or at least impair nociceptive transmission.[4,5,45]

The female patients in group A and group B reported higher mean postoperative pain than their male counterparts. This is probably related to their traditional and natural role of being the weaker gender.[42,43] In most cultures women are expected to experience or express pain more than men. Nayman, reported a higher pain score in females among the patients he studied, he also attributed this to cultural practices.[42]

It was observed in this study that the longer the operation time the more pain was experienced. The operations that lasted long were more likely to be major surgical procedures that entailed extensive tissue dissection. The more tissue dissection, the more trauma to tissues and nerves. There is consequently more afferent barrage of painful stimuli.[32,49,60-62] This will cause more pain and continue to act as a source of postoperative pain. The two groups were equally matched for type of incision and surgery.

The benefits of a promptly and adequately managed postoperative pain cannot be overemphasized and include a reduction in the patient's suffering and complications and shorter hospital stay.[37]

CONCLUSION AND RECOMMENDATIONS

The following conclusions can be drawn from the study:-

1. The incidence of postoperative pain in this study was 100%, all the patients operated upon experienced pain.
2. Intravenous small doses of pethidine produced significantly better pain relief than large intramuscular doses.
3. The maximum pain relief was at one hour after pethidine in both groups.
4. The pain relief was most effective for the first two and half hours after pethidine administration in Group A.
5. The majority of the operations performed were via lower midline and combined (upper and lower) midline incisions.
6. 94.6% of patients in Group A were satisfied with their pain relief compared with 71.4% of patients in Group B.
7. The commonest side effects of pethidine reported were nausea and vomiting.
8. Age, sex of the patient and duration of operation did not significantly affect postoperative pain when analysed statistically.

RECOMMENDATIONS

1. Since all operations are painful, pain relief should be provided immediately, regularly and adequately to patients to minimize discomfort, facilitate early recovery and reduce morbidity.
2. Small dose intravenous pethidine will produce immediate and better pain relief than intramuscular pethidine.
3. Pain score measurement should be part of postoperative monitoring in hospitals undertaking surgery.

4. Patients with a mean postoperative pain score of 1.5 and above should have their pain managed with narcotics.
5. Antiemetic drugs may have to be prescribed for administration with opioids in some patients.
6. All hospitals undertaking surgery should set up multidisciplinary acute pain teams to take responsibility for day to day management of postoperative pain.
7. There is need for more extensive, multicentre, comparative study to identify the most suitable drug for use in postoperative pain, in our environment.

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APPENDIX I

POSTOPERATIVE PAIN RELIEF IN ADULTS:

AN EVALUATION OF TWO ROUTES OF ADMINISTRATING

PETHIDINE IN ABDOMINAL OPERATIONS

PROFORMA

BY

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PERSONAL DATA

NAME.....HOSP.NO.....

AGE.....SEX.....TRIBE.....WEIGHT.....

OCCUPATION.....EDUCATIONAL STATUS.....

ADDRESS:-

.....

DATE OF ADMISSION:-.....DATE OF DISCHARGE:-.....

CLINICAL FEATURES.....

PRE- OP. DIAGNOSIS:-

.....

PREVIOUS OPERATION:-

.....

PRE-OPERATIVE MEDICATION:-

.....

TYPE OF ANAESTHESIA:L.A:-

.....G.A.....

OPERATION TIME

START.....STOP.....

INTRA-OP.DIAGNOSIS.....

OPERATION.....

SURGEON:

RESIDENT.....CONSULTANT.....

POSTOPERATIVE:

P.R.....B/P.....R.R.....

NOMINAL PAIN SCORE

SCORE		PATIENT SCORE
0	(NO PAIN)	
1	(MILD PAIN)	
2	(MODERATE PAIN)	
3	(SEVERE PAIN)	

POSTOPERATIVE PAIN TREATMENT WITH PETHIDINE

Dose.....

Route.....

Frequency.....

Time of injection.....

PAIN RELIEF SCORE, HOURS AFTER PETHIDINE INJECTION.

SCORES	1	2	3	4	5	6
0 NO RELIEF						
(SEVERE PAIN)						
1 MILD RELIEF						
(MODERATE PAIN)						

2 MOD. RELIEF

(MILD PAIN)

3 COMP.RELIEF

(NO PAIN)

POST INJECTION VITAL SIGNS HOURS AFTER PETHIDINE ADMINISTRATION.

VITAL SIGN	1	2	3	4	5	6
RESP. RATE						
PULSE RATE						
BLOOD PRESSURE						

SIDE EFFECTS

Nausea.....Vomiting.....Dry Mouth.....Blurred Vision.....

Urinary retention..... Constipation.....

Others.....

Are you satisfied with your postoperative pain treatment?

Yes.... or No...

APPENDIX III

McGill Pain Questionnaire - short form

	None	Mild	Moderate	Severe
	0	1	2	3
Throbbing				
Stabbing				
Sharp				
Cramping				
Gnawing				
Hot/burning				
Aching				
Heavy				
Tender				
Splitting				
Tiring				
Sickening				
Fearful				
Punishing				
Shooting				
Total points				