Research Article

Efficacy of morphine sulphate versus nalbuphine during functional endoscopic sinus surgery on intra-operative bleeding: A prospective, randomized, double blind study

Doaa A. Rashwan, Wael F. Hassan and Hend R. El-Gebaly
Department of Anaesthesia, Surgical ICU and Pain management, Faculty of Medicine,
Beni- Suef University, Egypt.

Abstract
The goal of this study is to compare the efficacy of morphine with that of nalbuphine on intra-operative bleeding in FESS operations. 68 patients, between 20 to 50 years old, were randomly grouped into two groups, 34 in each group. **Group 1:** received morphine 0.1 mg/ kg i.v 30 min before induction of anaethesia and group 2: received nalbuphine 0.1 mg/ kg i.v 30 min before induction. Both groups received nitroglycerin (0.5 – 10) mcg/kg/min at the start of procedure. Both drugs were successful to achieve a decrease in MABP with a significant statistical difference after 5, 15, 30, 45 min, with no significant difference after 45,60,75, 90 and 105 min. There was no statistical significant difference between both drugs concerning the HR all over the procedure time. Morphine group needed lesser doses of nitroglycerine than nalbuphine group to achieve hypotensive anaesthesia with a statistical significant difference. No significant differences found between both groups concerning bleeding loss, post operative side effects (nausea, vomiting, shivering), surgeon satisfaction score, sedation score or recovery time.

Keywords: Morphine, Nalbuphine, nitroglycerine, hypotensive anaesthesia, FESS, intra-operative bleeding.

Introduction
Functional endoscopic sinus surgery has become one of the most common head and neck procedures performed. It is also associated with a high rate of success (approximately 90%) for symptomatic improvement in patients with medically refractory chronic rhino sinusitis and chronic polypous rhino sinusitis.[(1)]

Bleeding impair visibility of the surgical field during the FESS procedure and is directly related to risk of vascular, orbital and intracranial complications as well as procedural failure. Hence, it is vital to the surgeon as well as the anaesthetist to reduce surgical bleeding for this operation.[(2)]

Bleeding may be difficult to control surgically due to extensive vascular supply in the sinus region and pathophysiological changes in the patient.[(2)]

Capillary bleeding is the most serious problem of note in this procedure and is responsible for any advertent trauma to the feeding arterial and venous vessels.[(2)]

Fortunately, bleeding from capillary circulation may be greatly reduced by decreasing the patient's mean arterial pressure and by local vasoconstriction.[(2)]

Controlled hypotension can be used as a specific measure in reducing surgical bleeding, especially in possible cases of extensive blood loss: in the presence of extended pathological process, scheduling a large scale intervention, and performing repeated surgical interventions.[(3)]

The two main strategies for achieving hypotensive anaesthesia are: (a) deep anaesthesia and heavy analgesia (b) standard anaesthesia and administration of hypotensive drugs. By deepening the anaesthetic plane and using high doses of analgesics, such as opioids, the recovery time may be prolonged. On the other hand, administering hypotensive agent to a patient who is anaesthetized using a standard

anaesthetic protocol may result in postoperative hypotension.[4]
In practice the two strategies are used to achieve hypotensive anaesthesia. In hypotensive anaesthesia, the patient's baseline mean arterial pressure (MABP) is reduced by 30%[5] . Consequently, the systolic blood pressure values are about 80- 90 mmHg and MABP is decreased to 50-65 mmHg. [6]

The key equation in the provision of hypotensive anaesthesia is: MABP= COP x SVR. Hence, MABP can be manipulated by reducing either systemic vascular resistance or cardiac output or both. Systemic vascular resistance can be reduced by peripheral vasodilatation and cardiac output can be reduced by lowering venous return, heart rate, myocardial contractility or a mix of these.[7]

Risk of tissue hypoxia by decreasing microcirculatory autoregulation of vital organs and by inhibiting ANS, so contraindications include, inexperience, infants, pregnancy, fixed cardiac output, coronary artery disease, renal and cerebral disease, hypovolemia, severe anaemia.[7]

Opioid narcotics may cause a drop in blood pressure during anaesthesia, reducing haemodynamic response to surgical stress, and subsequently reduce surgical bleeding [8].

The drop in blood pressure is due to mild bradycardia(due to decreased sympathetic drive and direct effect on sino atrial node), and peripheral vasodilatation(caused by histamine release and reduced sympathetic drive which may result in a slight fall in blood pressure that may be of importance in hypovolaemic patients).[9]

Patients and Methods

This was a randomized study performed in Beni-Suef university hospital within six months from January to July 2018 involving 68 patients. Written informed consents were obtained.

2.1 Inclusion criteria:

- Age from 20 to 50 years.
- American Society of Anesthesiologists (ASA) physical status I.

Exclusion criteria:

- Renal disease, liver dysfunction, pregnancy.
- Patients on hypnotic or narcotic analgesic.
- History of alcohol or drug abuse.
- History of allergic reaction to any drug used in this study.
- Bleeding diathesis.
- Previous nasal surgery.
- Patients on Non-steroidal anti-inflamatory drugs(NSAIDs).

Patients were randomly assigned into one of two equal groups (34 patients each). Randomization was carried out using a closed opaque envelope technique with the anesthetist who performed the injection had picked up a sealed envelope which contains a paper with the name of the group to which the patient randomized was written. Whichever the group written on the paper, the patient was scheduled to it.

A routine preoperative check-up was performed. Routine hematological and biochemical testing, along with electrocardiograms were performed for patients. On arrival to the operating theatre, 18 G intravenous cannula was inserted and IV crystalloid fluid was infused, the monitors were attached to the patients to take preoperative readings of heart rate, non-invasive arterial blood pressure and SpO_2. Another 20 gauge intravenous canulla was inserted for infusion of nitroglycerin (tridil) 0.5-10 mcg/kg/min, the aim was to obtain mean arterial blood pressure from 55 -60 mmHg.

The studied drug was prepared by anesthesiologist who was unaware to the study protocol. The patients were randomly divided to one of two groups:

Group M (n = 34): received Morphine sulphate (Morphine Misr Co Egypt) 0.1mg/kg in a total volume 10 ml of normal saline 30 minutes before induction of general anesthesia in a separate cannula.

Group N (n = 34): received Nalbuphine Hydrochloride (Nalufin ® Amoun Pharmaceutical Company S.A.E) , 0.1mg/kg in a total volume 10 ml of normal saline 30

minutes before induction of general anesthesia in a separate canula.

General anaesthesia was induced after pre-oxygenation for 3- 5 minute with 100% oxygen by facemask, then induction of anaesthesia in all patients was with the use of i.v. propofol 2 mg/ kg, atracurium (0.5mg/kg) and were ventilated manually with sevoflorane 2 Volume %, oxygen 100% via a face mask for 3 minutes, then oral cuffed endotracheal tube was inserted by expert anaesthesiologist. Anaesthesia was maintained with oxygen 100%, sevoflorane, additional doses of atracurium, mechanical ventilation with maintenance of end-tidal carbon dioxide 35-40 mmHg. An oropharyngeal pack was inserted after intubation. All the patients was operated by the same surgeon.

At the end of surgery, neuromuscular blockade was reversed with IV neostigmine 0.04 mg/kg and atropine 0.02 mg/kg, the trachea was extubated when the patient follows the criteria of extubation. All patients were transferred to PACU, where they received oxygen via face mask 3-4 L/min and were monitored.

The following parameters were evaluated and recorded by senior anaesthesiologist unaware of the study protocol:

1. Demographic data: age, sex, weight, height.
2. Mean arterial blood pressure and heart rate every 15 minutes.
3. Preoperative hematologic and post operative HB, Htc, platelets and (PT, PC, INR).
4. 4.The surgical site will rated according to:

a 6-point scale every 5 min by him in terms of bleeding anddryness. Surgeon's satisfaction was scored by the same surgeon with a 4-point scale.[127]

Surgical bleeding score and surgeon satisfaction score:

- Nasal bleeding score(%):

0= No bleeding
1= Minor bleeding, no aspiration required
2= Minor bleeding, aspiration required
3= Minor bleeding, frequent aspiration required
4= Moderate bleeding, visible only with aspiration
5= Severe bleeding, frequent aspiration required, very hard To perform surgery.

- Surgeon satisfaction score(%):

1= Bad
2= Moderate
3= Good
4= Excellent

5. Nitroglycerin used/patient (mcg).
6. Blood loss(ml).
7. Operative time and duration of controlled hypotension(minutes).
8. Number of patients required blood transfusion.
9. Recovery time.
10. Post operative side effects:
    - Nausea.
    - Vomiting.
    - Shivering.
    - Sedation: was assessed with a five-point scoring scale [128].

0= fully awake.
1= drowsy, closed eyes.
2= asleep, easily aroused with light tactile stimulation or a Simple verbal command.
3= asleep, arousable only by strong physical stimulation.
4= unarousable.

Statistical methodology

Analysis of data was performed using SPSS v.22 (Statistical Package for Social science) for Windows.

Description of variables was presented as follows:

- Description of quantitative variables was in the form of mean, standard deviation (SD), median and range.
- Description of qualitative variables was in the form of numbers (No.) and percent's (%).
- Comparison between quantitative variables was carried out by independent test which was used to test the difference between the means of several subgroups of a variable (multiple testing).

Follow up of different parameters overtime was carried out by repeated measure ANOVA.

The significance of the results was assessed in the form of P-value that was differentiated into:

- Non-significant when P-value > 0.05

- Significant when P-value ≤ 0.05
- Highly significant when P-value ≤ 0.01

Results

The current study was conducted at Beni-Suef university hospital within six months from January to July 2018. A total of 68 patients between 20 to 50 years old, were randomly grouped into two groups, 34 in each group. Group 1: Group 1: received morphine 0.1 mg/ kg i.v 30 min before induction and group 2: received nalbuphine 0.1 mg/ kg i.v 30 min before induction.

Table (1): illustrated that there were no statistical significant differences between both groups regarding age, sex, height and weight (P-value>0.05).

Table (1): Demographic Data

Demographic Data	**Group M (n= 34)**	**Group N (n= 34)**	**P-value**
	Mean ± SD	**Mean ± SD**	
Age (years)	36.06 ± 9.30	34.79 ± 8.86	0.568
Sex:			
Male	18 (52.9%)	15 (44.1%)	0.467
Female	16 (47.1%)	19 (55.9%)	
Height (cm)	164.32 ± 6.22	164.29 ± 6.05	0.984
Weight (kg)	67.91 ± 13.84	67.88 ± 9.85	0.992

Scale data was presented as mean±SD. Categorical data was presented as number and percent
*P-value is considered significant at < 0.05 -Group M= Morphine group -Group N= Nalbuphine group

Table (2) and figure (1): illustrated that there were no statistical significant differences between both groups regarding pre-operative MABP, HR and SPO_2 (P-value>0.05).

Table (2): Pre-operative measurements

Pre-operative measurements	**Group M (n= 34)**	**Group N (n= 34)**	**P-value**
	Mean ± SD	**Mean ± SD**	
MABP	91.44 ± 8.94	87.94 ± 8.29	0.099
HR	82.44 ± 10.91	78.79 ± 8.43	0.128
SPO_2%	98.00 ± 1.02	97.97 ± 1.00	0.905

Data was presented as mean±SD. *P-value is considered significant at <0.05
Group M=Morphine group
Group N= Nalbuphine group

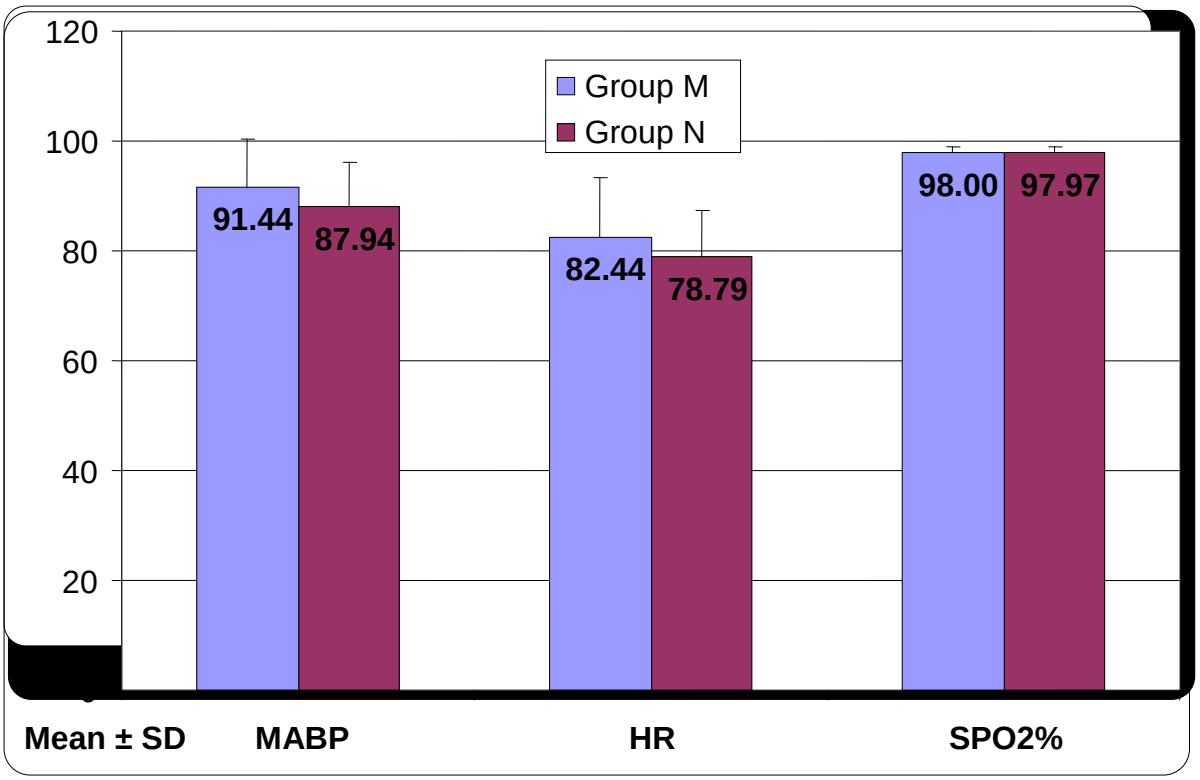

Figure (1) MABP, HR and SPO_2 in both groups.

Table (3) and figure (2): illustrated that there were no statistical significant differences between both groups regarding pre-operative Hemoglobin, Hematocrit, Platelets, PT, PC and INR.(P-value > 0.05).

Table (3): Pre-operative laboratory investigations.

Laboratory investigations	Group M (n= 34)	Group N (n= 34)	P-value
	Mean ± SD	Mean ± SD	
Hemoglobin	13.27 ± 1.25	12.88 ± 1.37	0.223
Hematocrit%	39.25 ± 3.55	38.13 ± 3.05	0.169
Platelets	284.59 ± 60.55	277.85 ± 68.46	0.669
PT(sec)	12.79 ± 0.71	12.87 ± 0.77	0.683
PC%	91.76 ± 6.17	90.82 ± 6.44	0.544
INR	1.08 ± 0.06	1.08 ± 0.06	0.563

Data was presented as Mean ± SD .
Group M = Morphine group
Group N = Nalbuphine group.

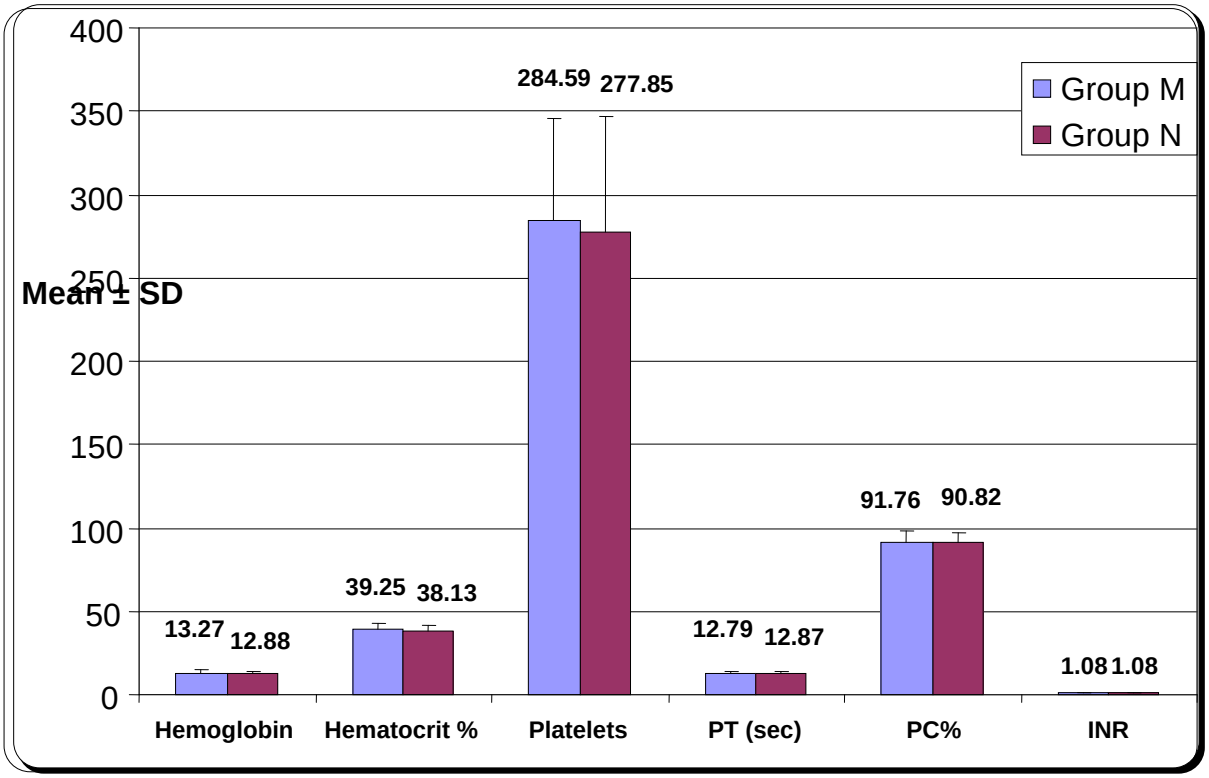

Figure (2): Comparison between both groups regarding Hemoglobin, Hematocrit, Platelets, PT, PC and INR.

Table (4) and figure (3): illustrated that there were no statistical significant differences between both groups regarding HR at (5, 15, 30, 45, 60,75, 90, and 105 min) intraoperatively, (p-valu> 0.05).

Table (4): Intraoperative heart rate.

Heart rate	Group M (n= 34)	Group N (n= 34)	P-value
	Mean ± SD	Mean ± SD	
After 5min	84.88 ± 12.33	81.62 ± 9.40	0.224
After 15min	82.68 ± 11.51	80.47 ± 9.51	0.392
After 30min	79.24 ± 10.64	79.41 ± 9.19	0.942
After 45min	77.12 ± 9.82	78.68 ± 8.88	0.495
After 60min	78.09 ± 8.65	78.36 ± 8.45	0.897
After 75min	76.64 ± 17.44	77.76 ± 8.82	0.792
After 90min	79.55 ± 6.77	76.33 ± 9.33	0.384
After 105min	79.50 ± 6.36	74.00 ± 6.93	0.438

Data was presented as Mean ± SD
Group M= Morphine group
Group N= Nalbuphine group.

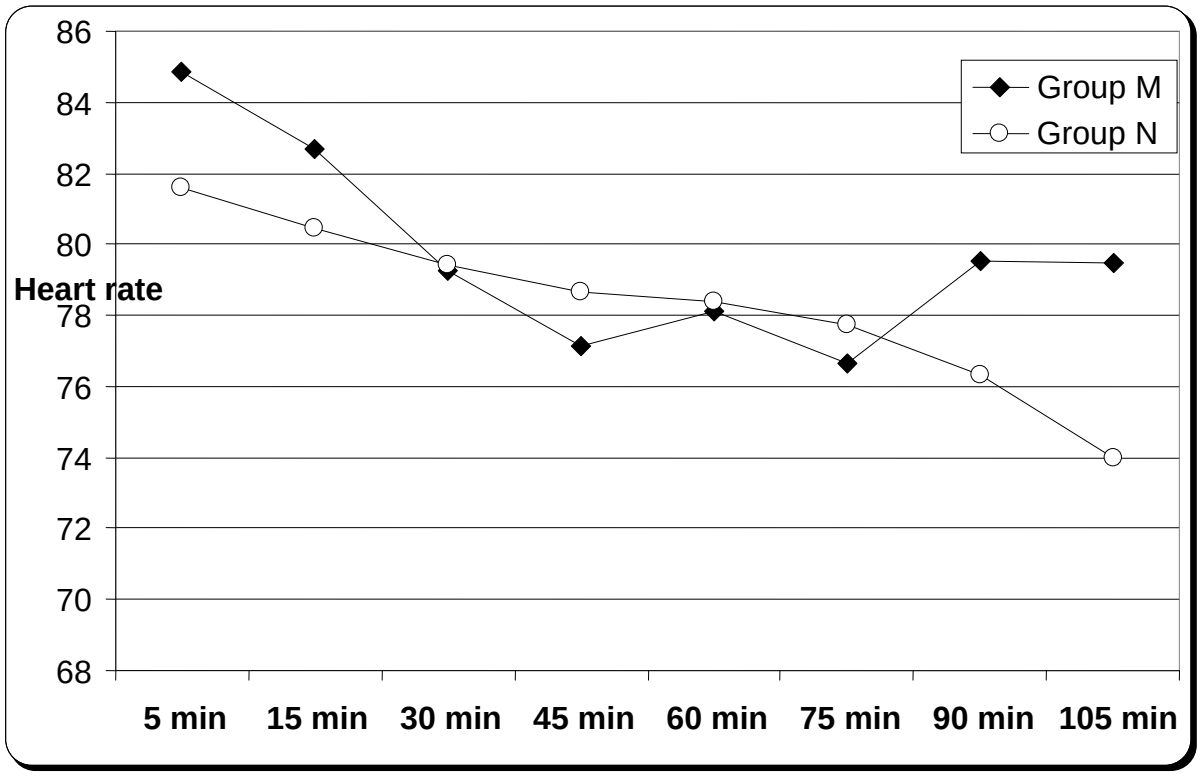

Figure (3): intra-operative HR in both groups.

Table (5) and figure(4): illustrated that there were statistical significant differences between both groups regarding intra-operative MABP after 5, 15, 30, 45 min (P-value<0.05).
MABP decreased more in Group M at these time intervals than the decrease in group N.There was no statistical significant differences between both groups regarding MABP after 60, 75, 90 and 105 min.(p-value >0.05).

Table (5): Intraoperative mean arterial pressure.

MABP	Group M (n= 34)	Group N (n= 34)	P-value
	Mean ± SD	Mean ± SD	
After 5min	73.97 ± 7.48*	79.68 ± 9.64	0.008
After 15min	70.24 ± 10.78*	76.76 ± 8.89	0.008
After 30min	61.44 ± 7.36*	67.18 ± 8.16	0.003
After 45min	55.35 ± 5.13*	59.15 ± 5.55	0.005
After 60min	53.91 ± 3.64	55.15 ± 4.27	0.208
After 75min	56.10 ± 4.88	53.76 ± 4.09	0.101
After 90min	57.00 ± 4.73	56.67 ± 4.42	0.874
After 105min	58.50 ± 3.54	59.33 ± 8.08	0.903

Data was presented as mean±SD. *P-value is considered significant at <0.05
Group M= Morphine group. **Group N=** Nalbuphine group

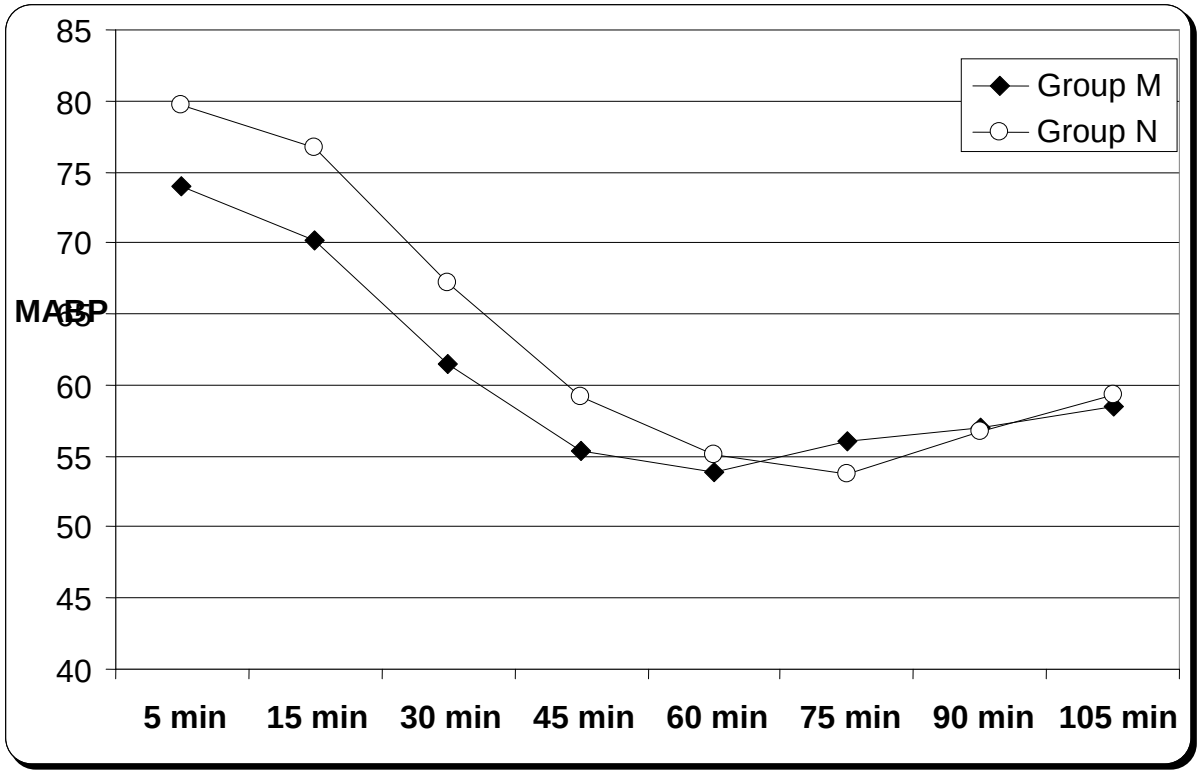

Figure (4) Intra-operative MABP in both groups.

Table (6): illustrated that there were nostatistical significant differences between both groups regarding bleeding score all through operative time.(p-value> 0.05).

Table (6): Bleeding score.

Bleeding score	Group M (n= 30)	Group N (n= 30)	P-value
	Median (Range)	Median (Range)	
After 5min	3.0 (2.0-3.0)	3.0 (2.0-3.0)	0.089
After 15min	3.0 (2.0-3.0)	3.0 (2.0-3.0)	0.060
After 30min	2.0 (2.0-3.0)	2.0 (2.0-3.0)	0.219
After 45min	2.0 (2.0-3.0)	2.0 (2.0-3.0)	1.000
After 60min	2.0 (2.0-3.0)	2.0 (2.0-3.0)	0.496
After 75min	2.0 (2.0-3.0)	2.0 (2.0-3.0)	0.299
After 90min	2.0 (2.0-3.0)	2.0 (2.0-2.0)	0.189
After 105min	2.0 (2.0-2.0)	2.0 (2.0-2.0)	1.000

Data was presented as Median (Range).-Group M= Morphine group -Group N= Nalbuphine group

Table (7) and Figure (6): illustrated that there was a statistical significant difference between both groups regarding haemoglobin (24 hour post operative),(p-value< 0.05). Postoperative haemoglobin measurement decreased more in group N than group M. There was no statistical significant differences regarding haematocrit, platelets, PT, PC and INR in both groups.(p-value> 0.05).

Table (7): Post-operative investigations.

Post-operative investigations	Group M (n= 34)	Group N (n= 34)	P-value
	Mean ± SD	Mean ± SD	
Hemoglobin	**11.93 ± 1.22***	11.30 ± 1.12	**0.030**
Hematocrit%	36.53 ± 3.60	35.82 ± 2.86	0.373
Platelets	265.91 ± 59.25	255.91 ± 67.10	0.517
PT	12.44 ± 0.75	12.70 ± 0.74	0.148
PC	90.82 ± 6.31	89.59 ± 5.83	0.405
INR	1.09 ± 0.07	1.08 ± 0.06	0.637

Data was presented as Mean ± SD.-Group M= Morphine group.- Group N = Nalbuphine group

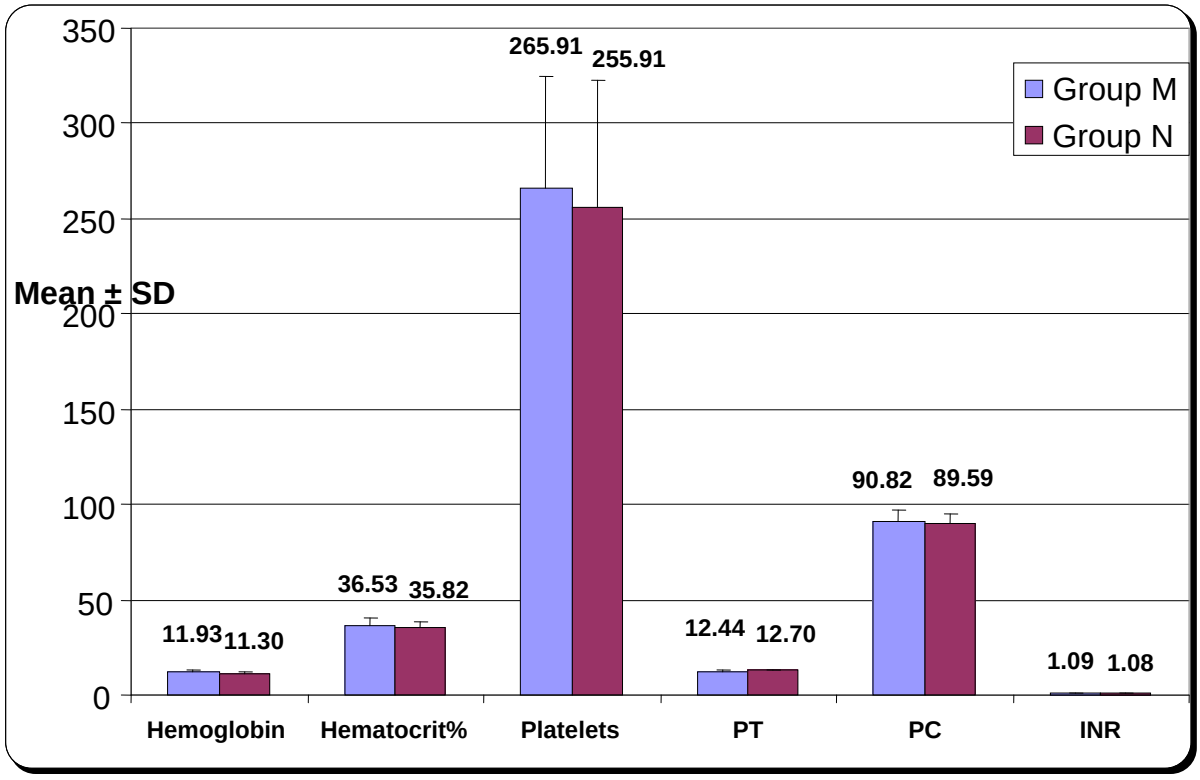

Figure (6): postoperative follow up of CBC and Coagulation Profile.

Table (8) and figure (7): illustrated that there was a significant difference between both groups regarding NG dose used (p-value< 0.05). NG dose was significantly lower in group M than in group N.

Table (8): Nitroglycerine dose used.

	Group M (n= 34)	Group N (n= 34)	P-value
	Mean ± SD	Mean ± SD	
Nitroglycerine dose used (micrograms)	2087.60 ± 1012.02*	**3056.45** ± 1123.64	**0.001**

Data was presented as Mean ± SD

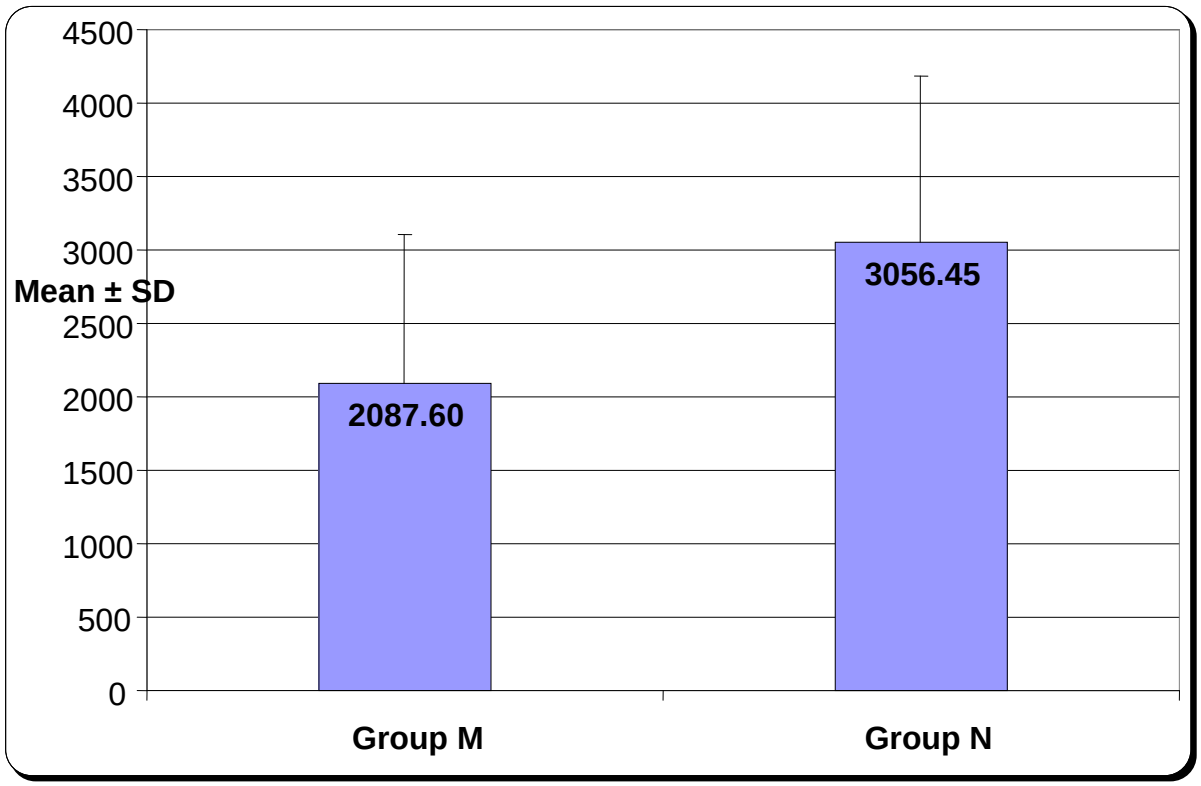

Figure (8): Comparison between NG doses used in both group.

Table (9) and figure (8): illustrated that there were statistical significant differences between both group regarding recovery time and duration of hypotension.(p-value< 0.05). Recovery time was significantly shorter in group N than in group M. Duration of hypotension was significantly less in group N than in group M. There were no statistical significant differences regarding Operative time, surgeon satisfaction and sedation score (p-value> 0.05).

Table (9): Post-operative measurements.

	Group M (n= 34)	**Group N (n= 34)**	**P-value**
	Mean ± SD	**Mean ± SD**	
Recovery time (min)	7.79 ± 3.06*	6.18 ± 2.15	0.014
Operative time (min)	78.97 ± 15.21	78.38 ± 14.18	0.870
Duration of hypotension (min)	56.03 ± 17.22*	45.00 ± 14.14	0.005
Surgeon satisfaction score Median(Range)	3.0 (2.0-3.0)	3.0 (2.0-3.0)	0.203
Sedation score Median (Range)	2.0 (1.0-2.0)	2.0 (1.0-2.0)	0.327

Data was presented as Mean ± SD or median.
Group M= Morphine group
Group N= Nalbuphine group

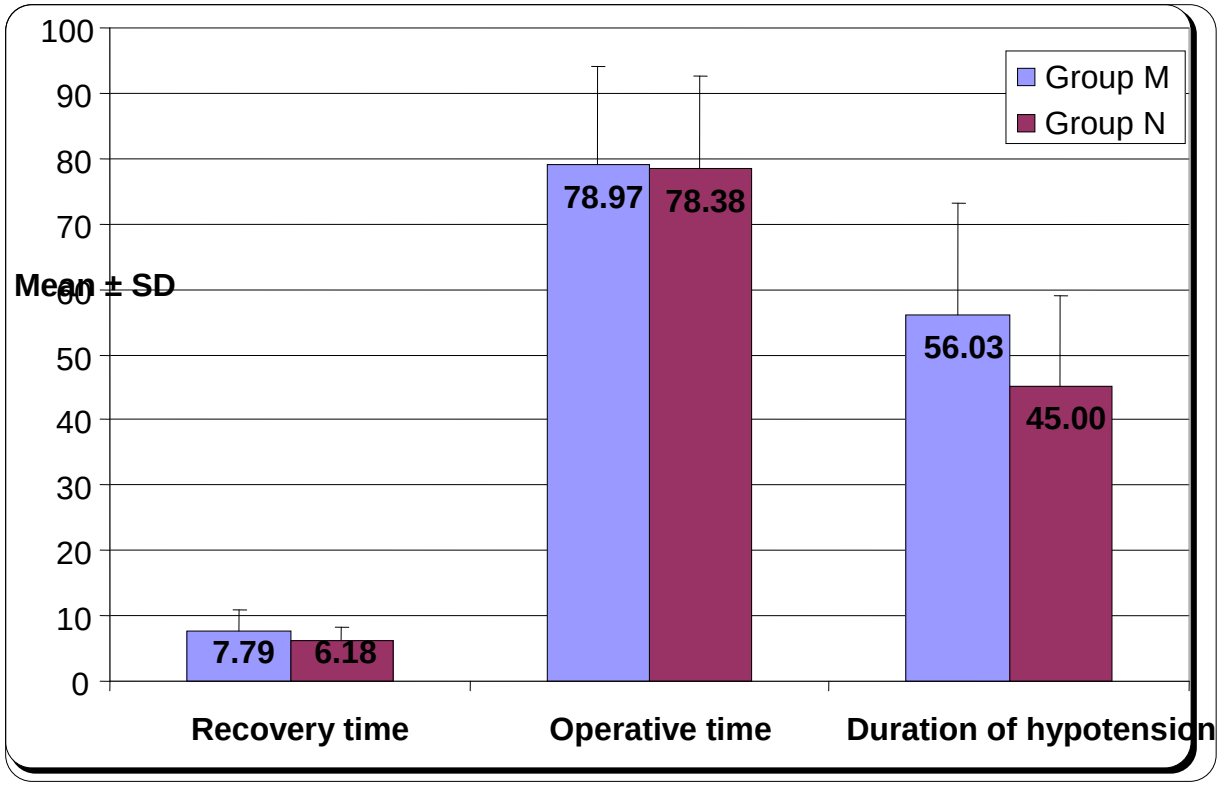

Figure (8): Comparison between recovery time, operative time and duration of hypotension in both groups.

Table (10) and Figure (9): illustrated that there were no statistical significant differences between both groups regarding blood loss amount (Figure 8), and blood transfusion (p-value> 0.05).

Table (10): Blood loss and blood transfusion.

	Group M (n= 34)	**Group N (n= 34)**	**P-value**
	Mean ± SD	**Mean ± SD**	
Blood loss amount(ml)	163.82 ± 32.19	152.94 ± 20.23	0.100
Blood transfusion No. (%)	0 (0.0%)	0 (0.0%)	--

Data was presented as Mean ± SD and (number &percent).

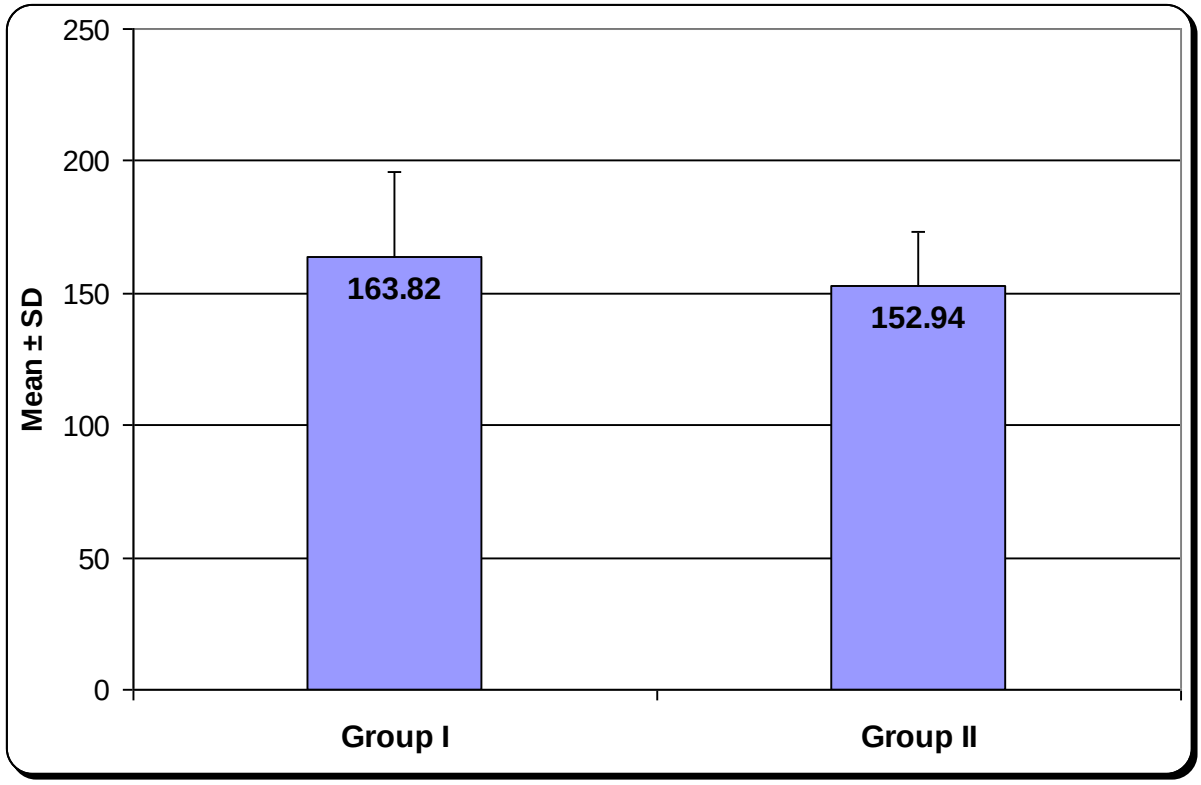

Figure (9): Comparison between Intraoperative blood loss amount in both groups.

Discussion

An important technique of reducing bleeding during the surgery is controlled reduction in blood pressure to such levels so that bleeding is minimal, but at the same time vital organs perfusion is well-maintained. This is the underlying concept for controlled hypotensive anesthesia[10].

Reduced bleeding in the operative field improves the quality of the surgical field, decreases the number of manipulations as well as the incidence of major complications and shortens the surgical time.[11,12]

FESS is a delicate and time consuming procedure; it is performed routinely under general anesthesia. Hypotensive techniques should be employed for best visualization of operative field.[13]

A variety of pharmacological agents can be used to induce intra-operative hypotension including vasodilators like sodium nitro-prusside,[14] nitroglycerin[15] and hydralazine; inhaled anesthetics like isoflurane[16] and sevoflurane; intravenous anesthetics like propofol; beta adrenergic antagonists like esmolol;[11] trimethaphan, adenosine and α_2 agonists.

Some of the reported disadvantages with the use of these agents include resistance to vasodilators, tachyphylaxis with nitroglycerin, cyanide toxicity with the use of nitroprusside and delayed recovery from anesthesia with the use of inhaled anesthetics in high doses. [17]

Opioid narcotics may cause a drop in blood pressure during anaesthesia, reducing haemo-dynamic response to surgical stress, and subsequently reduce surgical bleeding [8].

The drop in blood pressure is due to mild bradycardia (due to decreased sympathetic drive and direct effect on sino atrial node), and peripheral vasodilatation (caused by histamine release and reduced sympathetic drive which may result in a slight fall in blood pressure that may be of importance in hypovolaemic patients).[9]

In this study we compared between two different opioid drugs received half an hour

before induction of anaesthesia aiming at needing lower doses of intraoperative nitroglycerin for achieving hypotensive anaesthesia and hence; better surgical field. We had chosen a target MAP 55-60 mm Hg to provide the best surgical conditions without the risk of tissue hypoperfusion depending on a review of literature conducted by Barak et al., with a MAP of 50-65mmHg during major maxillafacial surgeries. [18]

Newton et al.,[19] investigated in 30 patients the metabolic and hormonal response to middle ear surgery using induced hypotension to MAP of 55 mmHg and concluded that this level of deliberate hypotension produced an endocrine and metabolic response of small magnitude and short duration that did not affect tissue oxygenation but kept it optimum.

Morphine is a naturally occurring phenanthrene derivative, it is the standard drug against which all other opioids are compared. The main effects are mediated through MOP receptors. It is a potent analgesic with good sedative and anxiolytic properties.

It has minimal effect on cardiovascular system and may cause bradycardia and hypotension. Nausea and vomiting are common side effects. Histamine release may lead to rash, itching and bronchospasm (in susceptible patients). Meiosis is common. Tolerance and dependence may develop.It produces respiratory depression and cough suppression.[20]

Nalbuphine is a semi-synsthetic opioid agonist-antagonist analgesic of the phenanthrene group. Its analgesic potency is essentially equivalent to that of morphine on a milligram basis. It does not increase systemic blood pressure, heart rate, atrial filling pressure or pulmonary artery pressure. [21]

As far as we know till the time of conduction of this study, no sufficient clinical trials studied the effectiveness of combining morphine or nalbuphine and direct vasodilator nitroglycerine infusion in producing hypotensive anaesthesia.

In this study, preoperative demographic data, MABP, HR, CBC and coagulation profile were comparable in both groups.

Regarding intra-operative parameters the study showed the following:
For HR, it increased only after 5 min in both groups then decreased to values near baseline values in both groups but, with no statistical significant difference.

Both drugs reached the desired MAP, but the decrease was more with morphine than nalbuphine with significant difference detected after 5, 15, 30 and 45 min post intubation. After 60, 75, 90 and 105 min there was no statistical significant difference between both drugs as regard to MAP decrease.

So, morphine provided more effective controlled hypotension and analgesia, than nalbuphine and thus, allowed better surgical field.
Opioids cause a drop in blood pressure during anaesthesia and minimizes surges in blood pressure due to surgical pain.[22]

Bleeding scores were between 2 and 3 with no statistical significant differences between both groups.

Michael C. Washburn[1] Rex L. Hyer[23] investigated a balanced halothane and morphine technique to achieve deliberate hypotension for elective major maxillofacial surgery. Fifty-eight patients underwent such procedures. Bleeding at the operation site was significantly reduced resulting in more efficient use of operating time and no patient required blood replacement as a result of intraoperative increased blood loss.

Nitroglycerine dose and number of patients treated with it was significantly less in morphine group than nalbuphine group. 25 of 34 patients in morphine group received NG; while 31 of 34 patients received it in nalbuphine group.

Regarding post-operative parameters the study showed:
Recovery time (time to reach aldrete score ≥9) was significantly earlier in nalbuphine than in morphine group.

Also duration of hypotension was statistically significant longer in morphine than nalbuphine group.

Surgeon satisfaction score was comparable between both groups.
Sedation score of 2 was noted in both groups with no significant difference.

Fragen and Caldwell[24], who used either 0.1mg/kg of intravenous morphine or nalbuphine as premedication, 11 to 14 minutes before induction of anaesthesia, also reported sedation to be comparable between both groups.

Nausea, vomiting and shivering were comparable in both groups.
Morphine is known to cause more PONV (48%) than nalbuphine (36%).[25]

ANTON A. VAN DEN BERG et al.,[26] concluded that nalbuphine (mean dose 0.13 mg kg') given as a single i.v. bolus during induction of anaesthesia, is most efficacious analgesic for routine in-patient ENT surgery than buprenorphine, diclofenac, fentanyl, morphine and placebo. Morphine provided poor sedation and analgesia, delayed the requirement for remedication and was highly emetic. Nalbuphine and pethidine produced sedation with analgesia during recovery, a prolonged time to remedication and a mild emetic effect.

Shiv Akshat, Rashmi Ramachandran, et al.,[27], concluded that Nalbuphine provides less effective intraoperative analgesia than morphine in patients undergoing open gynaecological surgery under general anaesthesia. Both drugs, however, provided similar postoperative analgesia and had similar haemodynamic and side effect profile. sedation scores were comparable in both groups immediately after shifting to PACU. Sedation decreased with time in both groups and was statistically comparable in both groups throughout the PACU stay.

T. J. Gal, C. A. DiFazio, et al.,[28] compared the analgesic efficacy of morphine and nalbuphine in 6 male patients subjected to pain and a ceiling effect in analgesic efficacy of nalbuphine in doses above 0.15mg/kg was found.

Operative time was comparable in both groups.
Haemoglobin percentage measurement 24 hour post operative was more in morphine group than nalbuphine group, but other lab investigations showed no significant difference between both groups.
Blood loss amount was more with morphine than nalbuphine group with no significant difference.

No patients needed blood transfusion in both groups and this is one of the main targets of controlled hypotensive anaesthesia.

Only one patient experienced bradycardia in morphine group and received atropine 0.5 mg I.V, and only one patient experienced MAP < 50 mmHg and received ephedrine 3 mg increment dose Morphine is known to cause bradycardia, probably by stimulation of vagal nuclei in medulla and direct depressant action on sinoatrial node, especially when co-administered with volatile anaesthetic agents.[29]
Lake et al.,[30] have also reported less cardiac depression with nalbuphine in comparison to morphine, even when the former is used in high doses (3mg/kg) in cardiac surgeries.

Conclusion and Recommendations We concluded that morphine 0.1 mg/kg IV statistically significant reduced the mean arterial blood pressure after 5, 15,30 and 45 min of intubation more than nalbuphine 0.1 mg/kg IV and also reduced the nitroglycerin doses used to achieve hypotensive anaesthesia in FESS operations with no statistically significant difference between the administration of morphine or nalbuphine on the heart rate all through operation.

It was performed in ASA I patients scheduled for elective surgeries. Further studies are recommended on patients more than ASA I.

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