



# MINIMIZING INTRA-OP BLEEDING DURING ESS



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## DISCLOSURE

# NONE

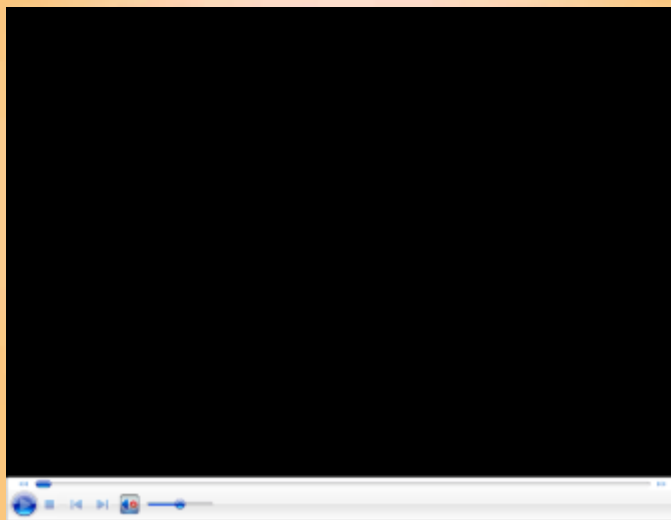
[www.sinuscentro.com.br](http://www.sinuscentro.com.br)

# WHERE I AM FROM



Fortaleza, 3 million

# SURGERY



[www.sinuscentro.com.br/museu](http://www.sinuscentro.com.br/museu)

## BLEEDING DURING ESS



## BLEEDING DURING ESS



October, 16, 1846.  
William Morton  
demonstrates  
anesthesia

## BLEEDING DURING ESS

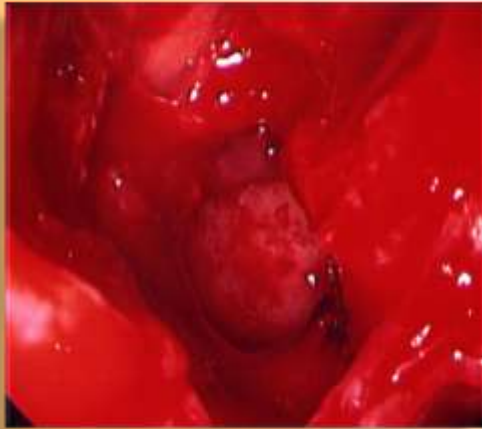


## BLEEDING DURING ESS



1 Cup Water  
1/4 Teaspoon  
Salt  
3 Tablespoon  
Pepper  
1/4 Cup Honey  
3 Teaspoon Ovaltin  
Bake 1/2 Minute  
(MMMMMM!)

## BLEEDING DURING ESS



- Anatomical landmarks identification
- Complications
- Postoperative
- Trauma of the nasal mucosa may lead to formation of adhesions

Kalra G, Keir J, Tahery J. Prevention of blood staining of endoscope tip during Functional Endoscopic Sinus Surgery: sleeve technique. J Laryngol Otol. 2009;123(12):1358-9.

## BLEEDING DURING ESS

- Bleeding could obscure the view of the endoscope.
- Repeated cleaning intraoperatively is time consuming.



Endoscrub – Medtronic, Jacksonville, USA, 2008

## BLEEDING DURING ESS

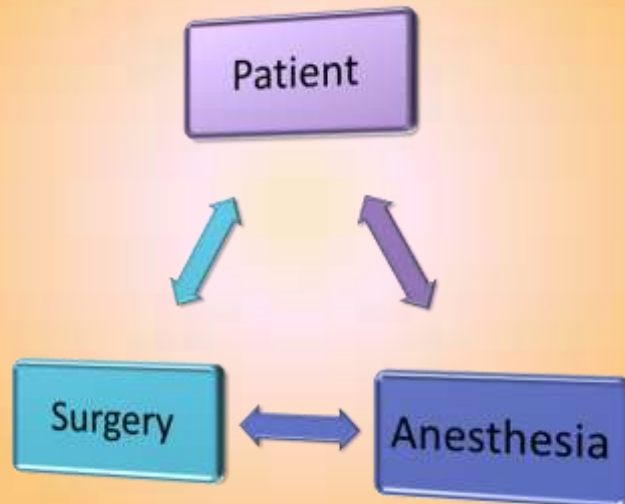


Book Prof. Navarro

## BLEEDING DURING ESS



## BLEEDING DURING ESS



## PATIENT

- Inflammatory mucosa
- Clinical conditions
  - HBP
  - Chronic diseases
  - Fever
- Smoking
- Pre-operative assesment



## PATIENT - SMOKING



## SURGERY

- Surgeon techniques
  - Instruments
  - Patient positioning
  - Room temperature
- Local vasoconstriction
- Infiltrations ?



# INSTRUMENTS



# INSTRUMENTS



# INSTRUMENTS



# INSTRUMENTS



## PATIENT POSITIONING



## PATIENT POSITIONING



## PATIENT POSITIONING

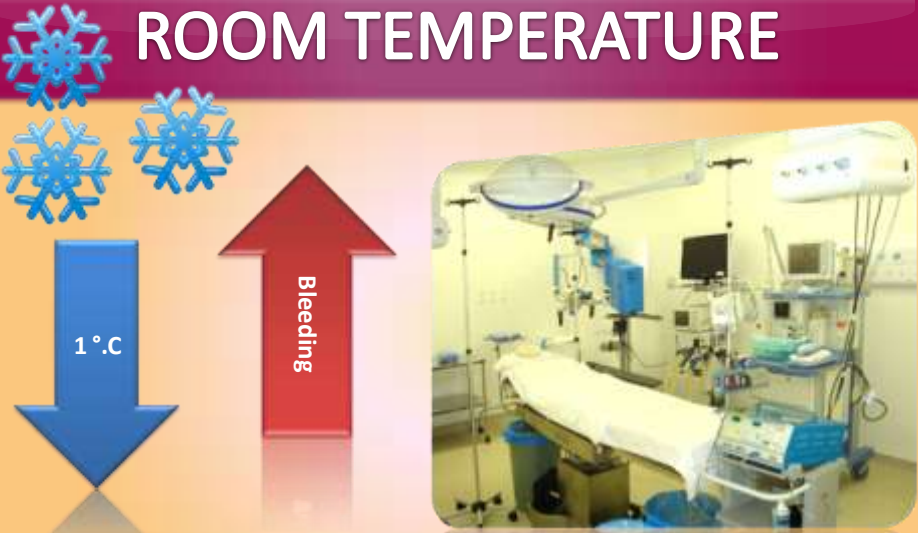


## PATIENT POSITIONING



**Increases venous return 30%**

## ROOM TEMPERATURE




**Reduces coagulation capability 30%**

Sarmento Junior KM, Tomita S, Kós AO. Topical use of adrenaline in different concentrations for endoscopic sinus surgery. Braz J Otorhinolaryngol. 2009;75(2):280-9.

## ROOM TEMPERATURE

- Ideal patient temperature: **36°C**
  - Saline heat
- Lower temperatures
  - Drug metabolism



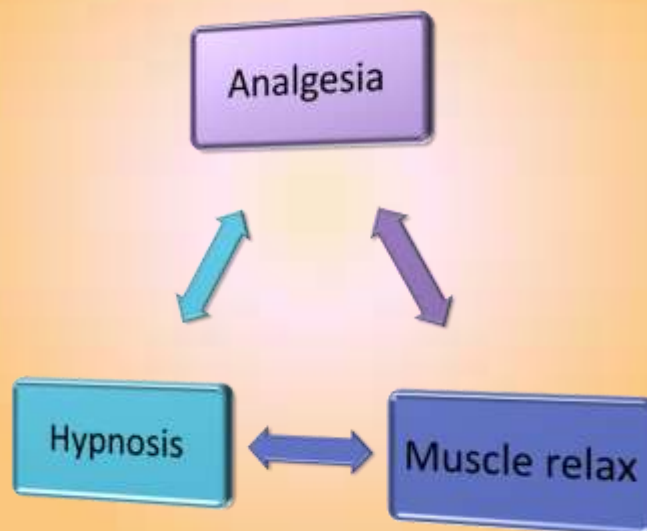
## LOCAL VASOCONSTRICTION

- Epinephrine
- Cocaine
- Oxymetazoline
  - 5 minutes
  - 10 minutes

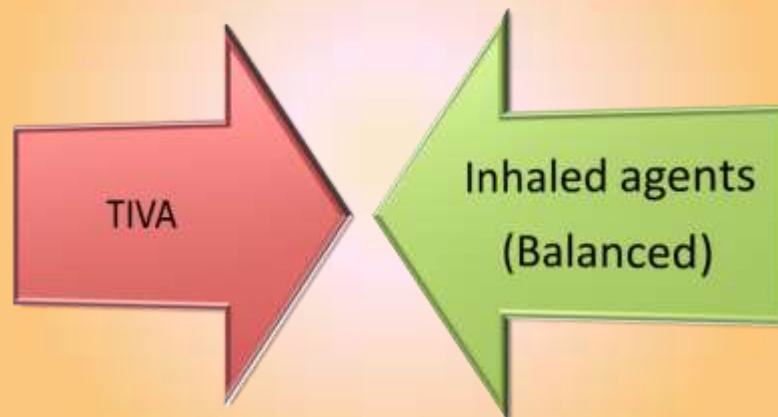


Sarmento Junior KM, Tomita S, Kós AO. Topical use of adrenaline in different concentrations for endoscopic sinus surgery. *Braz J Otorhinolaryngol.* 2009;75(2):280-9.

## ANESTHESIA



# ANESTHESIA



# ANESTHESIA

Otolaryngology-Head and Neck Surgery (2007) 136, 45-50

## ORIGINAL RESEARCH

### **Propofol versus sevoflurane: Bleeding in endoscopic sinus surgery**

Achim G. Beule, MD, Frank Wilhelmi, MD, Thomas S. Kühnel, MD, Ernil Hansen, MD, PhD, Karl J. Lackner, MD, PhD, and Werner Hosemann, MD, PhD, Greifswald, Mainz, Regensburg, Germany

# ANESTHESIA



**CONCLUSION:** Under conditions of balanced circulatory parameter, equal blood loss and endoscopic vision can be achieved with both tested anesthetic regimens. During extended operations demonstrated thrombocyte impairment by propofol may become clinically relevant.

# ANESTHESIA

- **Wormald PJ, van Renen G, Perks J, Jones JA, Langton-Hewer CD. The effect of the total intravenous anesthesia compared with inhalational anesthesia on the surgical field during endoscopic sinus surgery. Am J Rhinol. 2005; 19(5):514-20.**
- **BACKGROUND:** Bleeding during endoscopic sinus surgery (ESS) may increase complications and negatively effect the surgery and its outcome.
- The aim of this study was to compare TIVA (propofol+remifentanil) vs. inhalation anesthesia (sevoflurane).
- **RESULTS:** The two groups were matched for surgical procedure and computed tomography scores.
- Mean arterial pressure and pulse were found to influence the surgical field.
- **CONCLUSION:** In patients undergoing ESS, TIVA results in a better surgical field than inhalational anesthesia.

# ANESTHESIA

## Comparison of propofol and sevoflurane anesthesia by means of blood loss during endoscopic sinus surgery

*Remziye Sivaci, MD, Mustafa D. Yilmaz, MD, Canan Balci, MD, Tuna Erincler, MD, Halis Unlu, MD.*

**Conclusion:** General anesthesia based on propofol infusion may have the advantage of decreased bleeding compared with conventional inhalation agents. Therefore, making endoscopic surgery technically easier and safer by improving endoscopic visualization of the surgical field.

**Saudi Med J 2004; Vol. 25 (12): 1995-1998**

# ANESTHESIA

*British Journal of Anaesthesia* 100 (1): 50-4 (2008)  
doi:10.1093/bja/aem304 Advance Access publication November 3, 2007

BJA

## Comparison of surgical conditions during propofol or sevoflurane anaesthesia for endoscopic sinus surgery

H. J. Ahn<sup>1</sup>, S.-K. Chung<sup>2</sup>, H.-J. Dhong<sup>2</sup>, H. Y. Kim<sup>2</sup>, J. H. Ahn<sup>1</sup>, S. M. Lee<sup>1</sup>,  
T. S. Hahn<sup>1</sup> and J. K. Kim<sup>1\*</sup>

In summary, IVA results in less bleeding and a better surgical condition for patients undergoing ESS than conventional balanced anaesthesia, particularly in patients with a high-LM score who anticipate more blood loss.

## ANESTHESIA/MONITORING

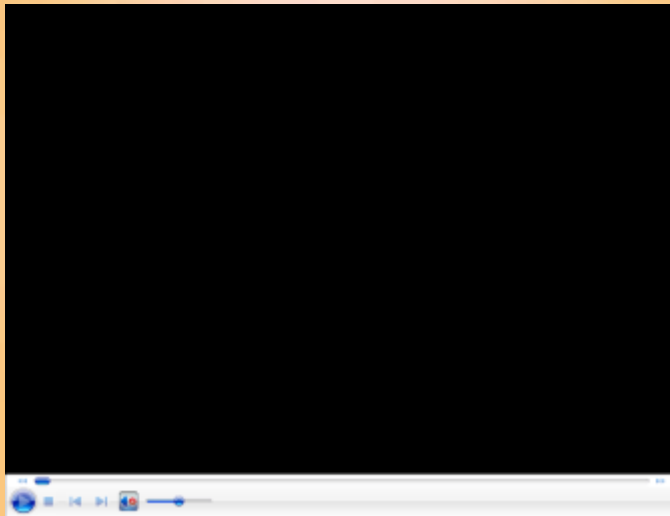
- CO<sub>2</sub>
  - Vasodilatation to target organs
  - Brain



## ANESTHESIA

- Ideal parameters:
- **Controlled hypotension**
  - BP: mean 60 – 70
  - HR < 60 bpm
  - CO<sub>2</sub> < 35
  - SPO<sub>2</sub> > 97%

# ANESTHESIA



# LOCAL VASOCONSTRICTION



History of dentistry. Sinus Centro Museu  
Available at: [www.sinuscentro.com.br/museu](http://www.sinuscentro.com.br/museu)

# LOCAL VASOCONSTRICTION



**1 : 2,000**

20 amps of epinefrine + 20 mL 0,9% saline solution  
Photosensitive (60 minutes)

# LOCAL VASOCONSTRICTION

Braz J Otorinolaringol.  
2009;75(2):200-9.

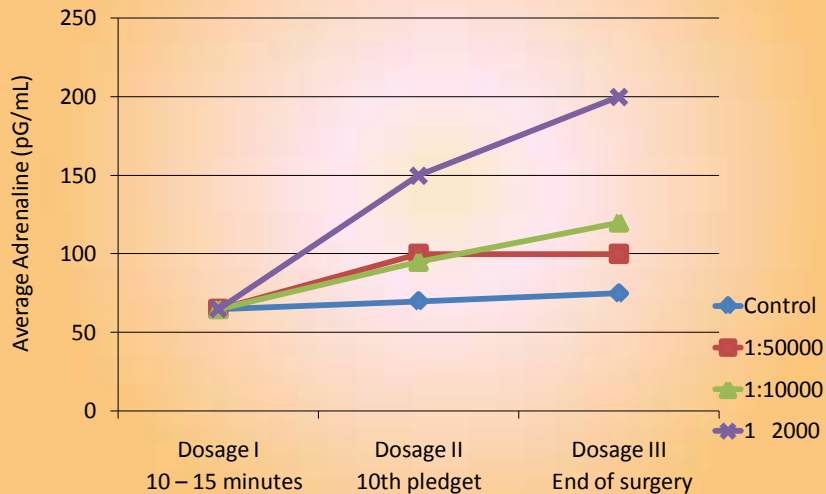
ORIGINAL ARTICLE

## Topical use of adrenaline in different concentrations for endoscopic sinus surgery

*Krishnamurti Matos de Araujo Sarmiento Junior<sup>1</sup>,  
Shiro Tomita<sup>2</sup>, Arthur Octavio de Ávila Kós<sup>3</sup>*

Keywords: paranasal sinus diseases, epinephrine, hemostasis surgical, norepinephrine, nasal polyps.

# LOCAL VASOCONSTRICTION



# LOCAL VASOCONSTRICTION

Table 4. Distribution of the measured hemodynamic parameters as normal and abnormal values for each group.

Parameter	Values	Adrenalin 1:2000	Adrenalin 1:10.000	Adrenalin 1:50.000	Group Control	p-value <sup>a</sup>	Significant differences <sup>b</sup>
HR	< 100 bpm	912 (99,2%)	915 (99,9%)	1013 (99,6%)	236 (99,6%)	0,45	None
	7 (0,8%)	1 (0,1%)	4 (0,4%)	1 (0,4%)			
	0	0	0	0			
SAP	< 140 mmHg	866 (94,2%)	857 (93,6%)	1012 (99,5%)	229 (95,6%)	< 0,0001	140-159 mmHg at 1:2.000 and 1:10.000 ≠ 1:50.000 and Control
	40 (4,3%)	48 (5,2%)	5 (0,5%)	8 (3,4%)			
	11 (1,3%)	10 (1,1%)	0	0			
	2 (0,2%)	1 (0,1%)	0	0			
DAP	< 90 mmHg	857 (93,3%)	868 (94,8%)	997 (98%)	235 (98,2%)	< 0,0001	90-99 mmHg at 1:2.000 and 1:10.000 ≠ 1:50.000 and Control
	90-99 mmHg	52 (5,7%)	45 (4,9%)	18 (1,8%)	1 (0,4%)		
	100-109 mmHg	8 (0,9%)	3 (0,3%)	2 (0,2%)	1 (0,4%)		
	> or equal to 110 mmHg	2 (0,1%)	0	0	0		

HR = Heart rate SAP = Systolic arterial pressure DAP = Diastolic arterial pressure  
 MAP = Mean Arterial Pressure p values: repeated measures ANOVA  
 Sig. df.b: Bonferroni multiple comparisons

## LOCAL VASOCONSTRICTION

Blood loss (mL)

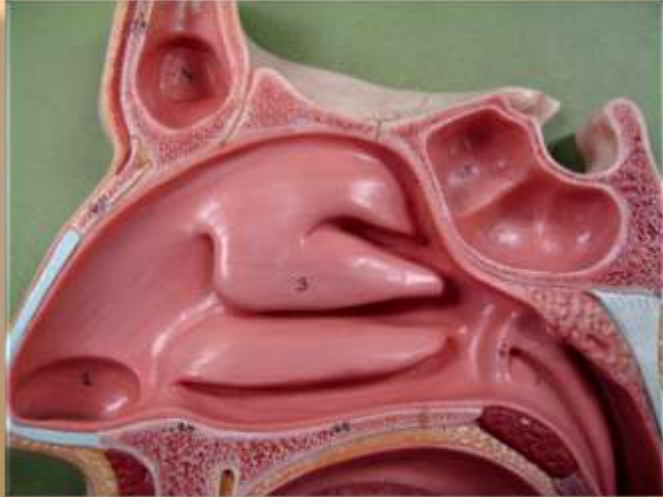
Group	N	Mean	D.P.	Median	Minimum	Maximum	p value*	Significant differences <sup>†</sup>
Adrenalin 1:2000	17	140,3	56,7	135	40	270	0,0001	
Adrenalin 1:10.000	16	336,9	20,40	315	85	750		1:2000 ≠ 1:10.000 1:2000 ≠ 1:50.000
Adrenalin 1:50.000	16	425,8	25,58	334	100	1100		1:10.000 ≠ 1:50.000

SD: Standard deviation p value\*: Kruskal-Wallis ANOVA for the three study groups.  
Sig. dif. <sup>†</sup>: Tukey's multiple comparisons test at 5%.

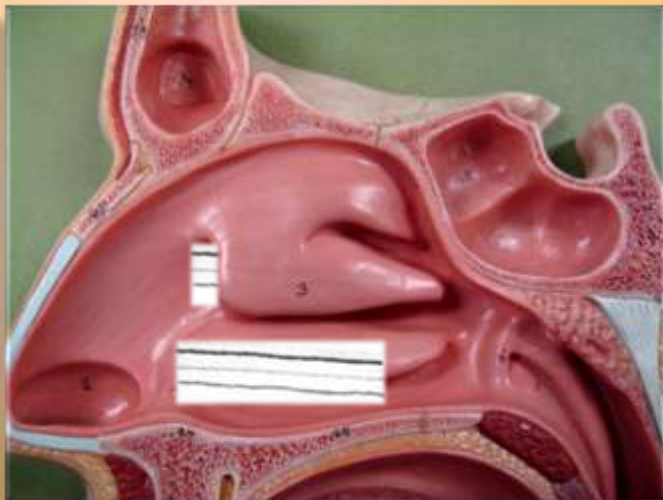
## LOCAL VASOCONSTRICTION

- Operation time was shorter (1:2,000)
- Less bleeding (1:2,000),  $p < 0,0001$
- Plasmatic levels of epinephrine raised in all groups, especially (1:2,000)
- There was a trend towards elevation of blood pressure in the groups using adrenaline 1:2,000 and 1:10,000, with a greater occurrence of hypertensive peaks.
- The elevation of blood pressure in the 1:2,000 and 1:10,000 was progressive but very slow throughout surgery, which could be related to the anesthesia technique.

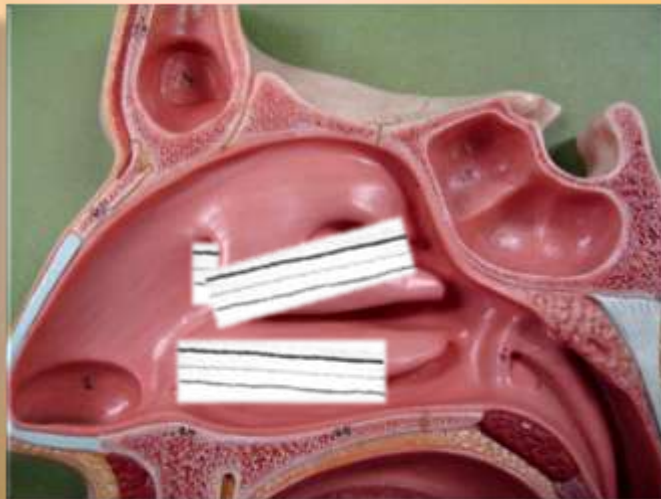
## LOCAL VASOCONSTRICTION



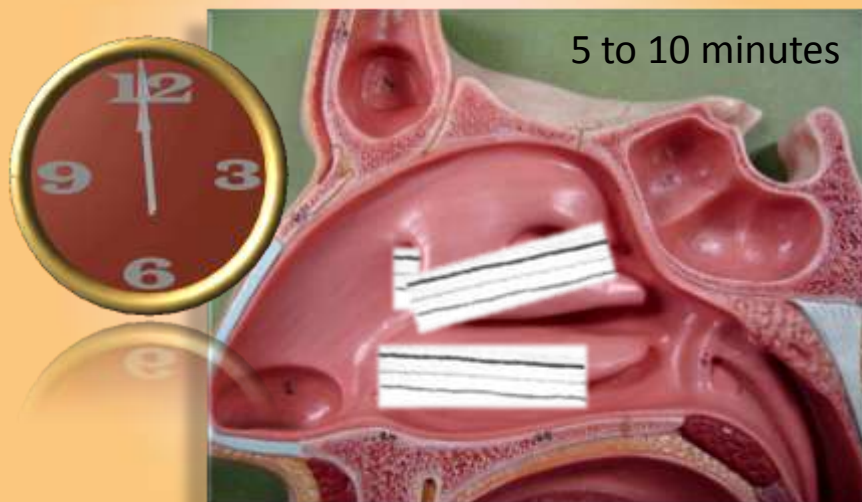
## LOCAL VASOCONSTRICTION



## LOCAL VASOCONSTRICTION



## LOCAL VASOCONSTRICTION



## VASOCONSTRICTION



## VASOCONSTRICTION



# INJECTION

Otolaryngology—Head and Neck Surgery (2009) 140, 209-214

ORIGINAL RESEARCH—SINONASAL DISORDERS

## Hemostasis during functional endoscopic sinus surgery: The effect of local infiltration with adrenaline

Ta-Jen Lee, MD, Chi-Che Huang, MD, Po-Hung Chang, MD, Chee-Jen Chang, PhD, and Yi-Wei Chen, MD, Taoyuan, Taiwan

1:100.000



# INJECTION

**Table 1**  
Patient demographics, stage of chronic rhinosinusitis, pre-anesthetic mean arterial blood pressure, operation time, and intra-operative blood loss

	Injection group	Noninjection group	P value
Number of Cases (n)	226	226	
Age (years)*	40.7 ± 14.3	40.8 ± 14.5	0.95
Sex (male/female)†	130/96	126/100	0.70
Body weight (Kg)*	63.5 ± 13.9	62.5 ± 13.3	0.41
Stage of CRS (stage II/III/IV)†	54/152/20	61/142/23	0.61
Pre-anesthetic mean arterial blood pressure (mmHg)*	93.8 ± 7.1	93.0 ± 7.3	0.25
Operation time (minute)*	130.4 ± 41.1	134.4 ± 44.7	0.32
Intra-operative blood loss (mL)*	316.9 ± 162.1	333.9 ± 167.8	0.29

\*P value ≤ 0.05 was significant.

\*Analytic method: independent-samples Student t test.

†Analytic method:  $\chi^2$  test.

# INJECTION

## ORIGINAL ARTICLE

### The Hemostatic and Hemodynamic Effects of Epinephrine During Endoscopic Sinus Surgery

*A Randomized Clinical Trial*

Ali Moshaver, MSc, MD, FRCSC; Denny Lin, MD, FRCSC; Ruxandra Pinto, PhD; Ian J. Witterick, MD, MSc, FRCSC

**Conclusion:** Submucosal injection of lidocaine, 2%, with 1:200 000 epinephrine during FESS does not lead to hemodynamic fluctuations or increased intraoperative bleeding compared with lidocaine, 2%, with 1:100 000 epinephrine.

# INJECTION

Table 3. Mean (SD) Hemodynamic Parameters at Baseline and Postinjection of Study Drugs at 1-Minute Intervals

Group (Dosage)	Time, min					
	0	1	2	3	4	5
1 (Lidocaine hydrochloride, 2%, with 1:100 000 epinephrine)						
HR, bpm	75.4 (18.7)	86.8 (18.2) <sup>a</sup>	82.3 (18.2) <sup>b</sup>	78.6 (18.0)	76.7 (18.0)	75.0 (17.1)
SBP, mm Hg	107.3 (17.5)	127.5 (27.0) <sup>a</sup>	128.0 (28.7) <sup>a</sup>	118.2 (26.5) <sup>b</sup>	110.2 (20.3)	104.8 (19.8)
DBP, mm Hg	61.1 (11.2)	72.7 (15.0) <sup>a</sup>	70.8 (14.5) <sup>a</sup>	65.5 (15.0) <sup>b</sup>	61.3 (14.1)	57.2 (13.1)
MAP, mm Hg	76.5 (11.8)	91.0 (17.6) <sup>a</sup>	89.7 (17.1) <sup>a</sup>	80 (17.1) <sup>b</sup>	77.6 (14.5)	73.1 (13.7)
2 (Lidocaine hydrochloride, 2%, with 1:200 000 epinephrine)						
HR, bpm	77.4 (14.7)	77.9 (14.5)	76.0 (14.0)	76.0 (13.9)	75.3 (13.4)	75.1 (13.5)
SBP, mm Hg	102.2 (15.4)	107.1 (15.8)	106.6 (15.6)	104.1 (15.8)	102.5 (16.9)	102.6 (17.3)
DBP, mm Hg	59.0 (12.8)	58.8 (10.7)	59.9 (10.0)	58.4 (10.7)	57.7 (9.8)	58.6 (10.7)
MAP, mm Hg	73.4 (12.1)	74.9 (11.3)	75.4 (11.1)	73.0 (11.5)	72.0 (11.1)	71.3 (11.9)

Abbreviations: bpm, beats per minute; DBP, diastolic blood pressure; HR, heart rate; MAP, mean arterial pressure; SBP, systolic blood pressure.

<sup>a</sup>P < .001 compared with baseline measurement.

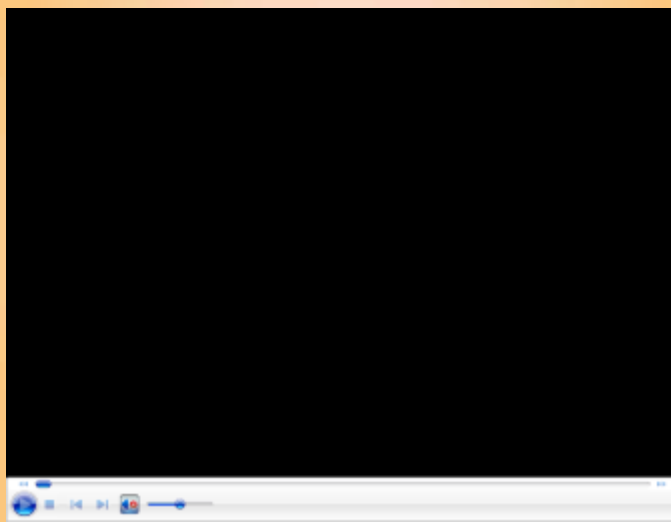
<sup>b</sup>P < .01.

## INJECTION

- **Pterygopalatine fossa**
  - Nasal – Endoscopy
  - Oral
- **Epinephine**
  - 1:200,000 – 0,005 mg/mL
  - 1:100,000 – 0,01 mg/mL
  - 1:80,000 – 0,0125 mg/mL
  - 1:50,000 – 0,02 mg/mL
  - 1:10,000 – 0,1 mg/mL
  - 1:2,000 – 0,5 mg/mL

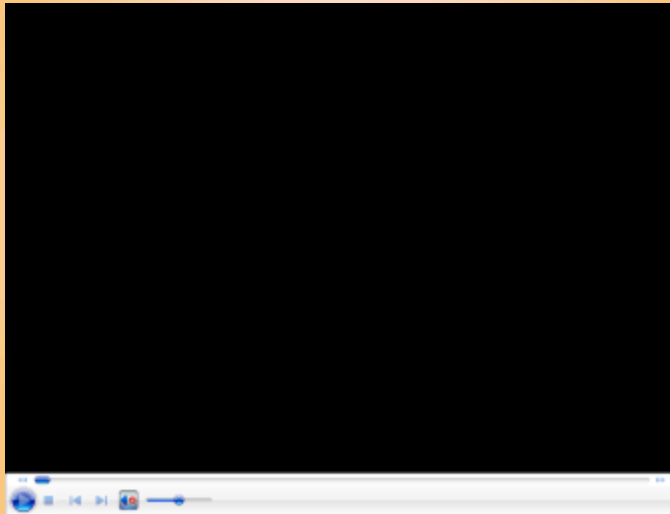


## INJECTION



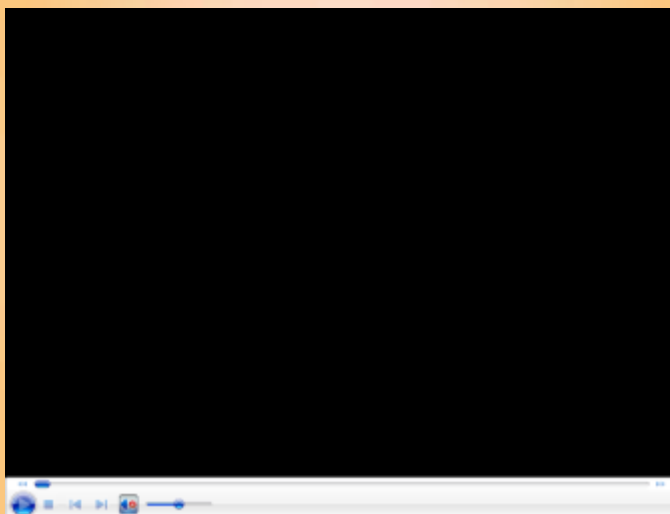
10 mL 1:100,000

# INJECTION



10 mL 1:50,000

# INJECTION



1 mL 1:10,000

## ANESTHESIA

- Lidocain
- High BP
- Paradoxal bradycardia (severe)

## SKULL BASE AND EAR



# CHOOSING THE RIGHT ANESTHESIA...



# IMAGING



Free X-Ray Examination to Patients.

1896

THE NEW LIGHT AND THE NEW PHOTOGRAPHY.

THIRTEEN YEARS AFTER YEARS, in England, adapted to the electric current. Patent granted in Great Britain and other countries.

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Sole Agents in  
15, RUE DE TRIVAN  
PARIS.

Nature, 20:August 1896

# IMAGING



**Sir Godfrey N. Hounsfield**  
CT – 1967  
Nobel Prize 1979



British Museum, 2008

# IMAGING

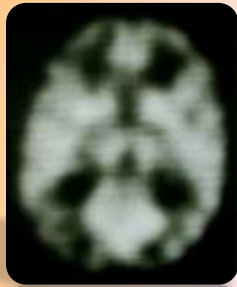


**Sir Godfrey N. Hounsfield**  
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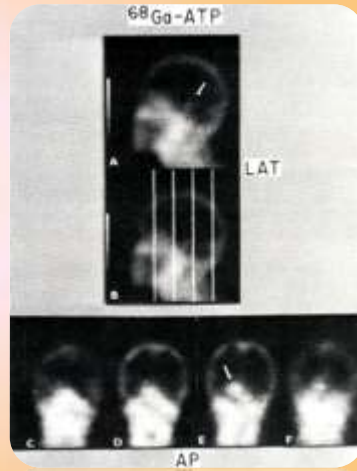


British Museum, 2008

# IMAGING

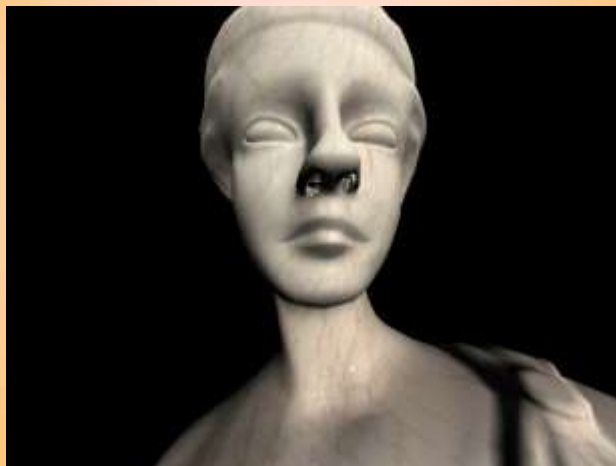


Brain study using CT. A tumor is clearly observable in the lower transverse slice. Images were presented by David Chesler at the Meeting on Tomographic Imaging in Nuclear Medicine, September 15-16, 1972.



British Museum, 2008

# IMAGING



3D reconstruction - DICOM files - Imaging Studio Software

## ATB



Nogueira JF, et al. Brief History of Otorhinolaryngology. Braz J Otorhinolaryngol, 2007 – with permission from Karl Storz company, Tutligen, Germany

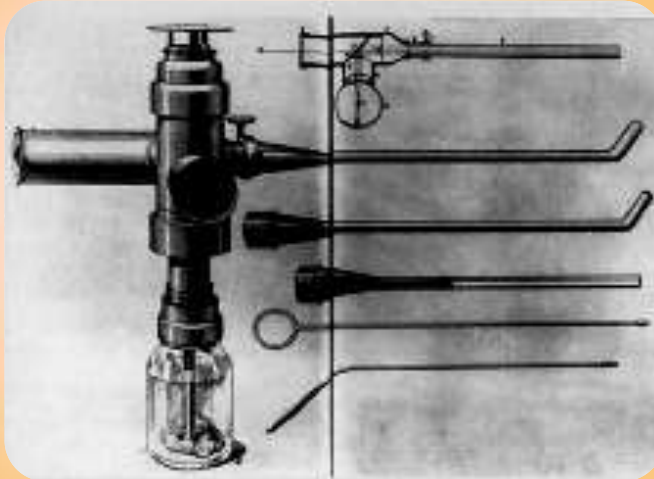
## ENDOSCOPES



# ENDOSCOPES



Desermeaux 1853

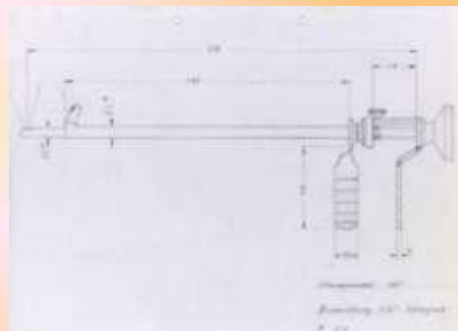


Nogueira JF, et al. Brief History of Otorhinolaryngology. Braz J Otorhinolaryngol, 2007

# ENDOSCOPES



Karl Storz and Harold Hopkins 1953



Nogueira JF, et al. Brief History of Otorhinolaryngology. Braz J Otorhinolaryngol, 2007 – with permission from Karl Storz company, Tutlingen, Germany

# ENDOSCOPES



1970s



1980s e 1990s



## F.E.S.S.

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# ANESTHESIA



October, 16, 1846.  
William Morton  
demonstrates  
anesthesia

# ANESTHESIA



**HOW TO  
CHOOSE ?**

## SURGICAL TRAUMA

- **Adrenergic stimulation**
- **Increase**
  - HR
  - BP
  - Cardiac debit
- **Peripheral vasoconstriction**
  - Increase peripheric vascular resistance



## ANESTHESIA IN ESS

- **Pre-operative assesment**
  - Interview
  - Physical examination
  - Complementary exams
- **Intra-operative anesthesia**
- **Post-operative care**

## INTERVIEW AND PHYSICAL

- **QUESTIONS**

- Do you bleed too much during dental ?
- Females – How is your period ?
- Lacerations – How long is the bleeding time ?
- Nasal bleeding – Do you have ?

- **PHYSICAL**

- Hematomas
- Articular deformities

## MEDICATIONS

- **Ask about medications in use:**

- **Aspirin**

- 7 days prior to surgery

- **Coumadin**

- 2 – 6 days

- **Ginkgobiloba**

- 36h

- **Garlic and ginseng**

- 7 days



## PRE-OPERATIVE

- Hipertension
- Diabetes
- Heart disease
- Lung disease
- Renal disease
- Liver disease



- **MAINTAIN USE OF MEDICATION**
- **(Except, methformin, IECA, etc)**

## PRE-OPERATIVE

- **Orientations:**

- **Fasting:**

- Children: 6 hours (solids); 2 hours (liquids)
    - Adults: 6 hours (solids); 2 hours (liquids)

- **Liquids: water, coconut water, tea, juice without residuals (apple, etc)**



# ANESTHESIA



# ANESTHESIA



# ANESTHESIA

- **BLEEDING CONTROL**
  - Controlled hypotension
  - Ventilation
  - Positioning



# ANESTHESIA

- **CONTROLLED HYPOTENSION**

$$BP = CD \times PVR$$

$$CD = HF \times SV$$

- **Objective:**
  - Reduce CD, yet preserving flux to target organs
  - MBP > 50 mmHg
  - CO<sub>2</sub> > 30
  - FiO<sub>2</sub> > 90%

## ANESTHESIA

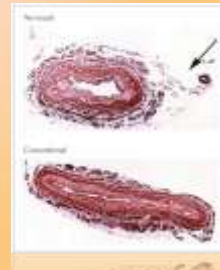
- **Ideal parameters: ASA I and II**
- **Controlled hypotension**
  - BP: mean 60 – 70
  - HR < 60 bpm
  - CO<sub>2</sub> < 35
  - SPO<sub>2</sub> > 95%

## DRUGS

- Hypnosis: **PROPOFOL**
- Opioid: **REMIFENTANIL**
- Alpha2agonist: **DEXMEDETOMIDINE**
- Beta Blocker: **ESMOLOL**
- Alpha1agonist: **DROPERIDOL**
- Vasodilator: **NITROPRUSSIATE**

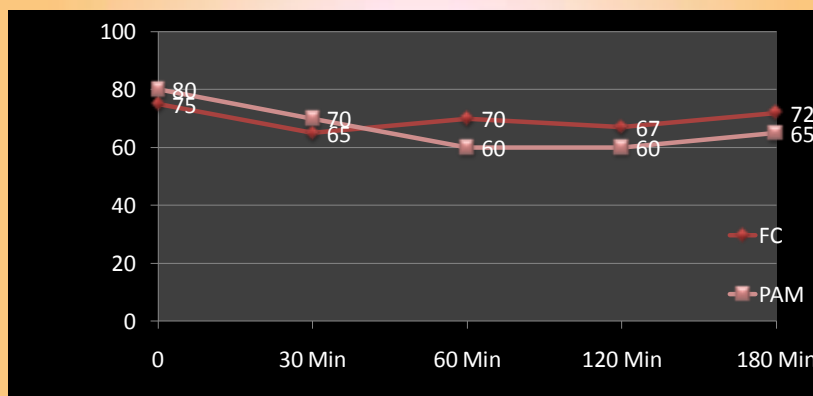
## DRUGS

- Opioids and beta blockers cause important reduction of the adrenergic response to stress
- Dexmedetomidine increases the sympatic responses
- **Propofol** increases peripheric vasodilatation – liberation of nitric oxide



## DRUGS

- Hemodynamic parameters – PRO + REM



# TIVA

- Avoids environment pollution
- Reduces final use of drugs
- Previsible awakening



# MONITORING

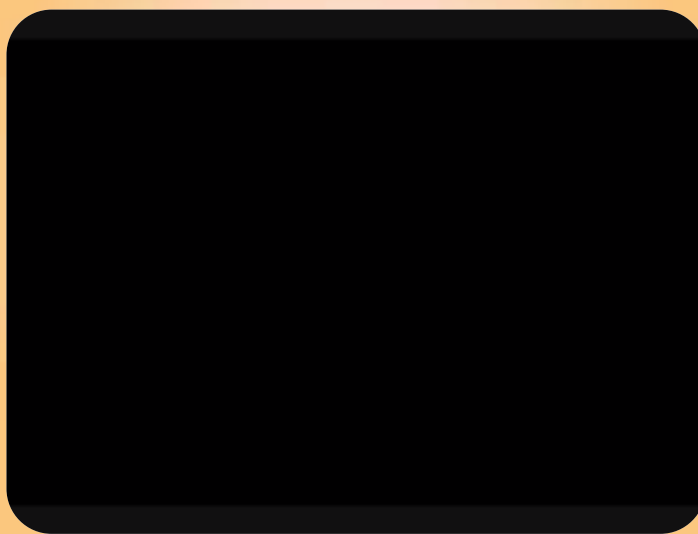


# MONITORING

- **BIS** - Optional



# MONITORING



# VENTILATION

- Positive pressure (airway) – 20 mmHg
- Venous stasis
- Reduce pre-cargo LV and RV
- Increase post-cargo RV



# TUBES

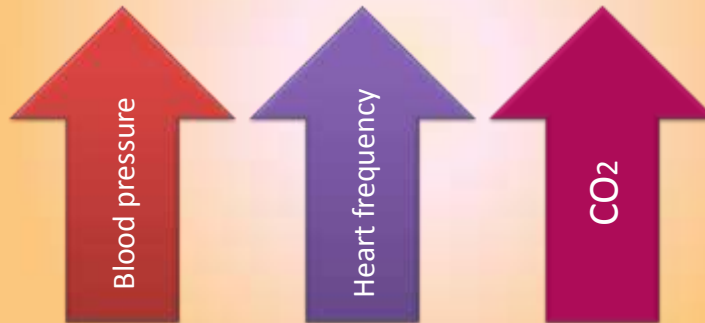


Tube's diameter  
Women: 7 – 7,5  
Men: 8 – 8,5



# ANESTHESIA

- AWAKENING



# POST-OPERATIVE

- **Analgesia**
- **Nausea control**
  - Zofran
  - Dexamethazone
- **Patients comfort**



## LOCAL ANESTHESIA ?

- ESS with local + sedation
- Ambulatory procedures
- Balloon sinuplasty ?

Auris Nasus Larynx, 2009 Aug;36(4):411-5. Epub 2008 Nov 20.

**Endoscopic endonasal transeptal approach for localized sphenoid sinus diseases.**

Hinohira Y, Hyodo M, Gyo K.

Department of Otolaryngology, Takanoko Hospital, 525-1 Takanoko-cho, Matsuyama, Ehime 790-0925, Japan. hinohira@m.ehime-u.ac.jp

## LOCAL ANESTHESIA ?

- Sedation:
  - Adult, 70 Kg
    - Dormonid
    - Fentanyl
    - Local anesthesia

Acta Otorhinolaryngol Belg, 1996;50(1):1-12.

**Functional endoscopic sinus surgery under local anaesthesia: possibilities and limitations.**

Jorissen M, Heulens H, Peters M, Feenstra L.

Department E.N.T., Head and Neck Surgery, UZ Leuven, Belgium.

# LOCAL ANESTHESIA ?

- **Advantages**

- Faster procedures
- Quick recovery
- Less bleeding
- Low cost procedure
- Day basis



- **Disadvantages**

- Unsecured airway
- Patient discomfort ?



"640K RAM memory will be enough for anybody."  
Bill Gates, 1981

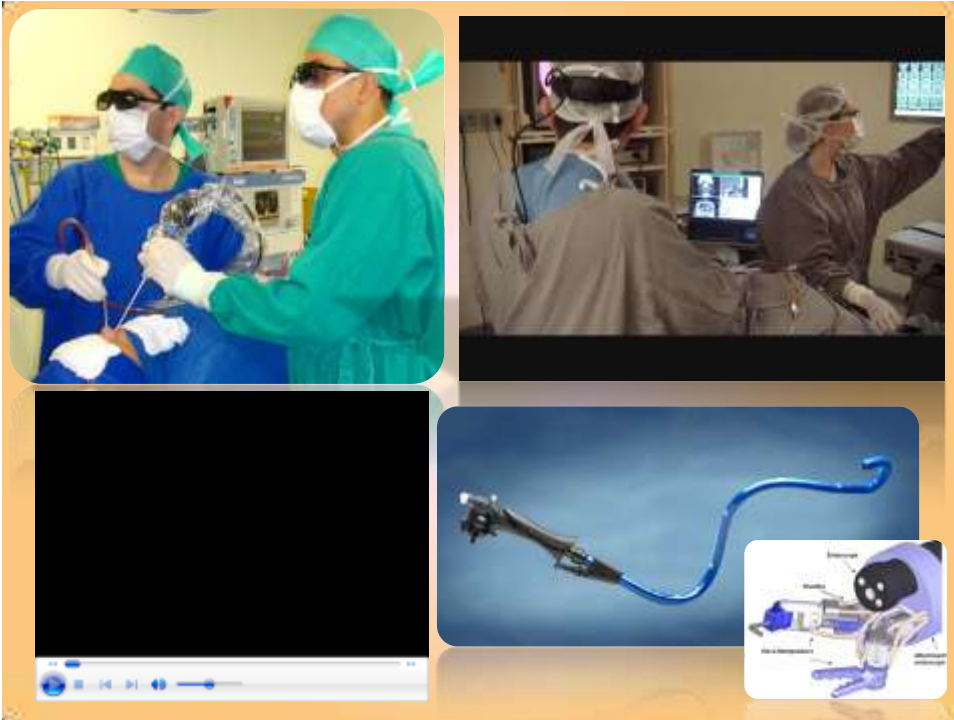


"There is no reason anyone would want a computer in their home."  
Ken Olson, 1977



"Fooling around with alternate current is just a waste of time. Nobody will use it ever."  
Thomas Edison, 1889

Top 87 Bad Predictions about the Future  
Published on 3/28/2006



***“The best way to predict  
the future is to create it”***

***Peter F. Drucker***

[www.sinuscentro.com.br](http://www.sinuscentro.com.br)  
[joaoflavioce@hotmail.com](mailto:joaoflavioce@hotmail.com)

## CONCLUSION

- **Choosing the right anesthesia technique to ESS is important**
- **Tailored to the patient - TASS**
- **Pre, intra and post-operative care**
- **Future...**

## CONCLUSION

- Time is important
- Clean and dry surgical field is crucial
- Different techniques
- Talk to your anesthesiologist
  - TESS: Tailored endoscopic sinus surgery
  - TASS: Tailored anesthesia for sinus surgery

