



Gas and Remifentanyl

The ideal combination for
future surgery?

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Does gas pollute the OR?

Limit in Norway is 20 ppm

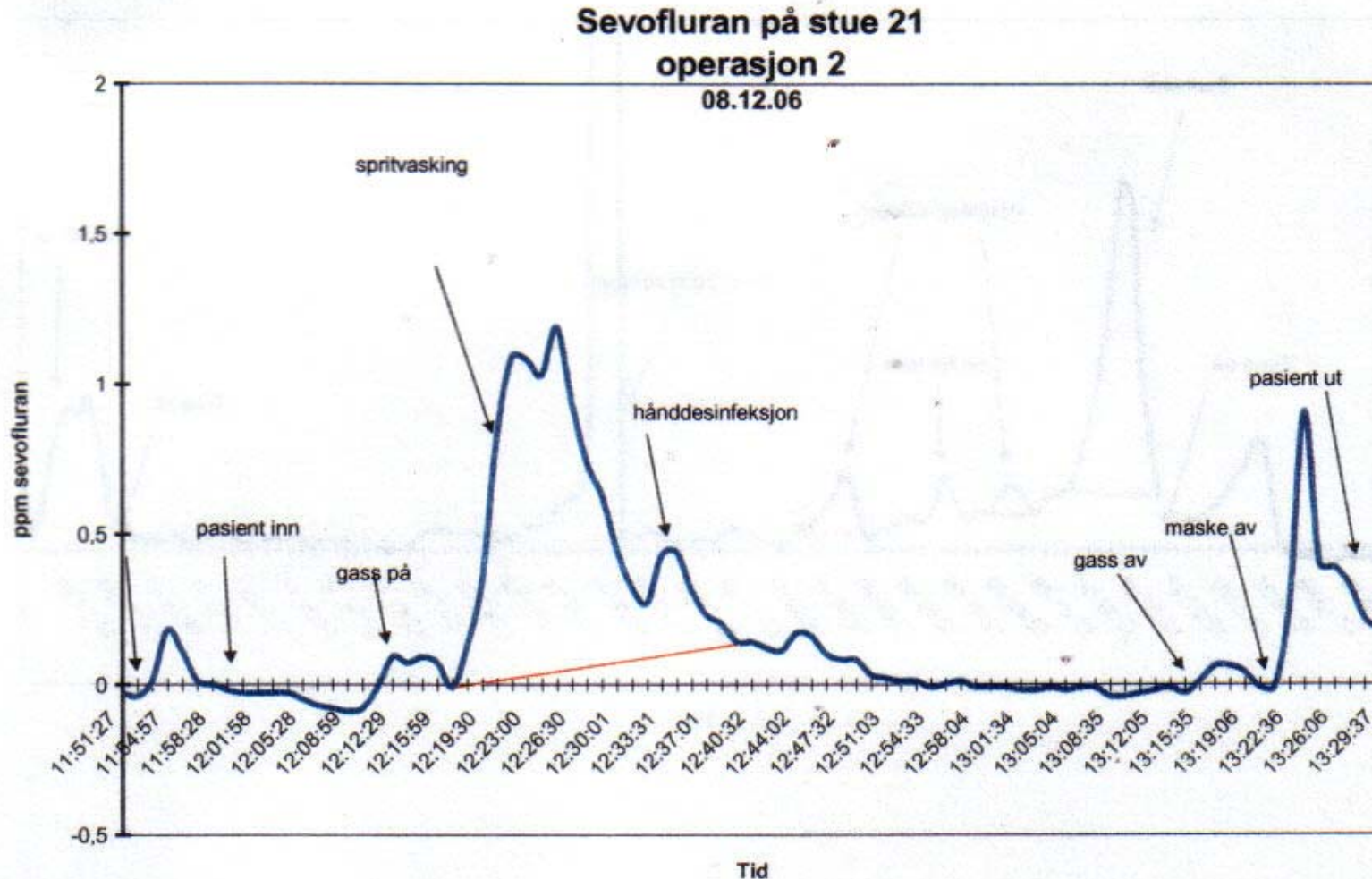


Table 1: Sevoflurane concentrations in the operating room (OR), Ambulatory Surgery Unit, Haukeland Hospital.

OR	Date	Sevoflurane (ppm)	
		Mean/op	Mean/15 min
OR 21, op1	08.12.06	0,13	0,26
OR 21, op2	08.12.06	0,08	0,22
OR 22, op3	14.12.06	0,18	0,44
OR 22, op4	14.12.06	0,10	0,24

Refilling sevoflurane (OR 22) 14.12.06: 10,3 ppm/2min

In OR 21 PPV ventilation on Laryngeal mask for ankle surgery.

In OR 22 , Intubation and gall bladder surgery.

What about recovery profiles ??

Two multicenter studies comparing ISO/REM and PRO/REM, no differences were found with regard to recovery profiles

- *Wilhelm W et al. J Clin Anesth 2000;12:129-35*
(250 pasienter, PONV similar)
- *F. Chung et al . Acta Aneaesthesiol Scand 2000; 44: 790-798* (854 pasienter, nausea 7% and 14% for TIVA and GAS respectively)

Propofol/remifentanil vs sevoflurane/remifentanil for long lasting surgical procedures: a randomised controlled trial.

J. Høcker et al. Anaesthesia. 2006 Aug;61(8):752-7.

- 103 patients, 18-65 år, BIS <40-50> until end of surgery
- Elective surgery lasting > 3,5 hrs
- Premed: chlorazepate 20 mg, Midazolam 7,5 mg po
- Induction: etomidate/remifentanil/rocuronium, TOF < 3 perioperatively
- Initiale maintenance doses:
 - Remifentanil 0,25 µg/kg/min in both groups
 - Sevofluran: 0,5 MAC (sevo/remigruppe) **BIS**
 - Propofol : Target: 2 µg/ml (propofol/remigruppe) **BIS**
- Pitramide 7,5 mg iv 15 min før kirurgislutt

	Sevorane/remifentanil	Propofol/remifentanil
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Remifentanil	7,3	6,9
Total dose (mg)		
Mean Sevo/propofol	1,21 % (ET)	2,55 µg/ml (TCI)
Mean Sevo/propofol when ekstubating	0,17 % (ET)	1,19 µg/ml (TCI)
Ekstubate (min)	10, 8	8,3 *
Shivering incidence, postoperatively (%)	35	41
PONV incidence, postoperatively (%)	25	20
Discharge (min)	82	79

- BIS values, HR, BP: no differences during maintenance of anaesthesia
- Similar cognitive functions postoperatively
- Similar intensity of pain and doses of analgetics postoperatively

- After 24 hours: No differences with regard to shivering, PONV, pain and patient satisfaction

Bispectral index-guided administration of anaesthesia: comparison between remifentanil/propofol and remifentanil/isoflurane.

Eur. J Anesthesiol. 2003 Aug;20(8):624-30

- 80 patients in two groups
- BIS 45 – 60
- Propofol eller isoflurane, BIS guided
- Remifentanil according to hemodynamic respons;
start 0,25 µg/kg/min
- Morfin 0,15 mg/kg iv 30 minutes before end of surgery
- BIS 60-75 15 min before end of surgery.
- Anesthetics removed at end of surgery.

	Propofol/remifentanil	Isoflurane/remifentanil
Propofol / Iso (mean)	7,3 mg/kg/time	0,66 %
Remifentanil (µg/kg/min)	0,31*	0,18
Surgery (min)	118*	92
Opening eyes (min)	4,1	5,0
Ekstubate (min)	6,6	6,4
Aldrete > 9 (min)	11,2	12,2

- Baseline data similar
- More somatic responses in PRO group
- More events hypotension in ISO group
- BIS similar
- No awareness
- Higher doses of remifentanil needed in PRO group
- No differences in recovery profiles

How much does remifentanil reduce your gas administered?

Effects of Two Target-controlled Concentrations (1 and 3 ng/ml) of Remifentanil on MACBAR of Sevoflurane

Albertin, Andrea M.D.*; Casati, Andrea M.D.*; Bergonzi, Piercarlo M.D.†; Fano, Greta M.D.†; Torri, Giorgio M.D.‡

Anesthesiology, Volume 100(2), February 2004, pp 255-259

74 adult patients for abdominal surgery, nitrous oxide 0,55 MAC, MAC with regard to haemodynamic responses

Remifentanil (ng/ml)	0 (N=27)	1 (N=27)	3 (N=20)
Sevoflurane MACBAR	2,8 %	1,1%	0,2%
MAC when including N2O and age	1,95 MAC	1,1 MAC	0,68 MAC

Sevoflurane reduction of 60 – 90 % in adults

Remifentanil decreases sevoflurane requirements in children.

Castanelli DJ et al. Can J Anaesth. 2005 Dec;52(10):1064-70.

- 58 children 2-12 år, hernie/hydrocele surgery
- ED50 sevoflurane in 4 groups with regard to somatic respons

Remifentanil ($\mu\text{g}/\text{kg}/\text{min}$)	0,03	0,06	0,12	0,25
N	22	14	16	6
Age	5,7	6,9	5,2	7,3
Sevoflurane MAC (Vol%)	2,39 %	1,91 %	0,92 %	0,29 % ??

Use GAS/REM instead of PRO/REM.....

- Pollution in OR – no problem even with PCV and laryngeal mask.
- PONV, recovery profiles and patient satisfaction are similar
- Remifentanil reduces MAC 60-90 %
- Similar haemodynamic profiles. BP lower with ISO/REM.
- With gas (isoflurane) you need less remifentanil during maintenance of anesthesia than with propofol
- its cheaper. Using SEV/REM, you save 3,8 £ each anaesthesia hour when flow is 1,5 L/min - even cheaper with isoflurane.

(Sneyd J. R et al. British Journal of Anaesthesia 2005: 94 (6): 778-83.)

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- You protect the heart perioperatively with regard to ischemia
 - One infusion pump – less accidents, less connections.
 - Monitoring based on real values (ET) and not estimated ones
 - Avoid accidental subcutaneous injections of propofol, avoid pain when injecting



- Its serious
- Its real
- Its fun