

Bubble recordings after nitrox dives with a semi-closed demand controlled rebreather



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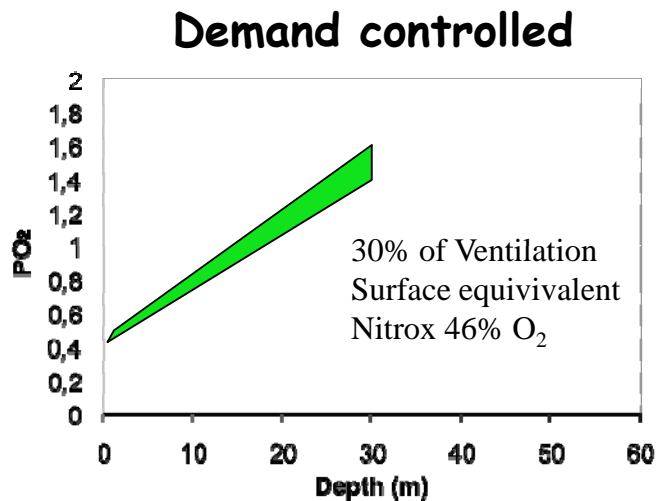
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BACKGROUND AND AIMS

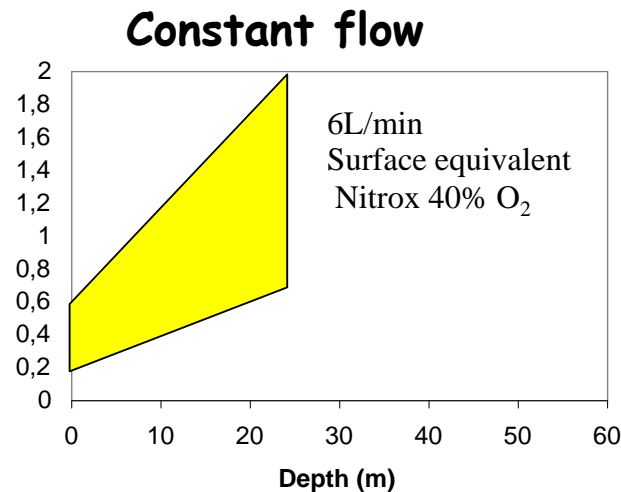
- Swedish Navy has used the Interspiro DCSC for mine clearance divers using 46/54 nitrox (≤ 30 msw) and 28/72 nitrox (> 30 msw) with good operational safety record
- For dives > 30 msw used with air tables (\approx USN 56)
- Swedish Navy will implement new tables, also looking at mixed gas (trimix) for the deeper range instead of nitrox
- Dives to serve as basis for comparison with new tables
- Dives used to compare bubble monitoring with 2D-ultrasound and audio ultrasound Doppler

THE INTERSPIRO DEMAND CONTROLLED SEMI-CLOSED REBREATHER (DCSC)

- Mechanically controlled - oxygen dosage proportional to diver's ventilation
- Constant mass oxygen dosage - FO_2 pressure independent
- FO_2 dependent on ratio ventilation to oxygen uptake (22.5:1)



$K = 17.5 - 25$



$VO_2 = 0.25 - 3 \text{ l/min}$

METHODS

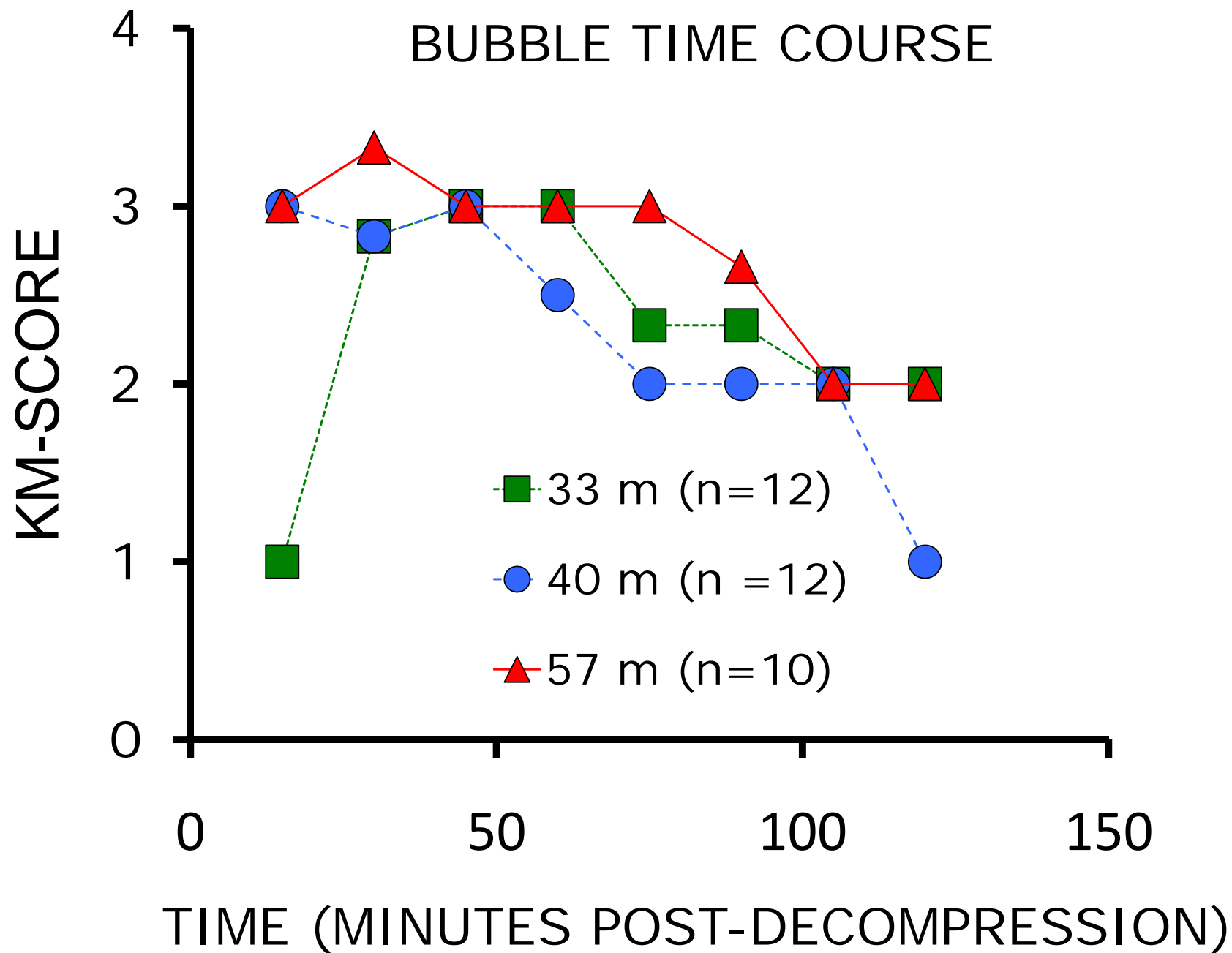
- 14 clearance divers carried out 1 - 3 dives each
- Divers equipped with time/depth loggers
- DSCS with 28% O₂/72% N₂ - gives FO₂ in loop: 22 - 23%
- 33 msw/30 min (TDT: 9 min), 40 msw/20 min (TDT: 9 min), 57 msw/15 min (TDT: 14 min)
- Descent/ascent speed: 18 msw/min

METHODS (ctd)

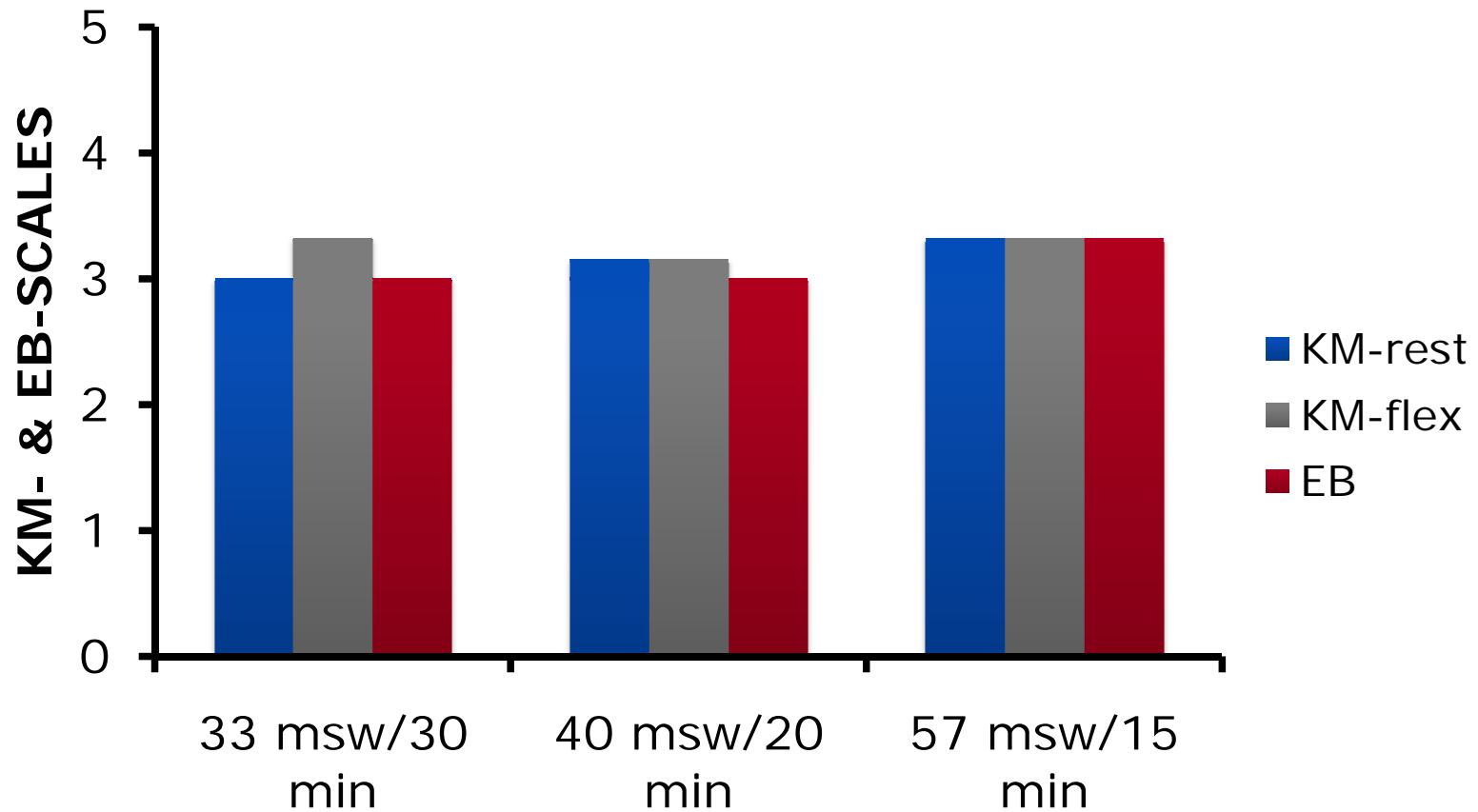
- Divers transported to land \approx 10 min
- Pre-cordial Doppler ultrasound (rest, and 3 knee flexes) each 15 min for 2 hours post decompression
- One operator scored immediately using the **Kisman-Masurel scale**
- 2D-ultrasound every 30 min for 2 hours post decompression (2 operators)
- Scoring carried by independent observer according to **Eftedal-Brubakk scale**

RESULTS

- All dives carried out according to plan
- One case of bends after 40 msw/20 min dive
(EB-scale: 4, KM-scale: 3+)
Treated successfully with TT6
- Most divers had bubble scores around 3 - 3+ on
KM-scale ("rest" and/or "flex")



MEDIAN MAXIMUM BUBBLE SCORES



KM (min-max): (0 – 3+)

(0 – 3+)

(3 – 4)

CONCLUSIONS

- KM (Doppler)- and EB (2D)-scales correlated well in this range of bubble scores
- Square dives produced surprising lot of bubbles (and 1 DCS) despite good operational record:

"square" vs "triangular" dives, use of safety factors
- Oxygen sensor should be incorporated in circuit in future testing