Burns from plaster backslabs - is current practice safe?

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Chemistry

$CaSO_4, 0.5H_2O + 3H_2O \rightarrow CaSO_4,2H_2O$ + **heat**

(Plaster of Paris) (Gypsum)

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Factors contributing to plaster burns

- ***Patient Factors***
  - poor vascularity
  - oedema

- **Plaster application factors**
  - **Inadequate padding** under plaster
  - **Dipping water temperature** >24˚C (Lavalette et al)
  - > 8ply **thickness of plaster** ((Lavalette et al)
  - **Inadequate ventilation** (e.g overwrapping, pillow, blanket) (Halanski et al)
  - Insufficient dipping time/overenthusiastic squeezing out of water (Kaplan et al)

- **Other factors**
  - local anaesthesia
  - tourniquet use

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Water temperature

Water temp 20°C

plaster	1m	5m	10m	15m	20m	25m	30m	35m
16 layers	21.8	21.4	25.0	32.2	**36.5**	32.4	30.2	29.6
12 layers	20.2	21.6	25.4	27.7	**31.5**	30.9	28.5	26.2
8 layers	21.6	21.6	23.2	29.1	**31.2**	28.8	25.8	23.4

Water temp 40°C

plaster	1m	5m	10m	15m	20m	25m	30m	35m
16 layers	34.9	36.8	41.4	**44.5**	39.8	35.4	31.8	28.4
12 layers	35.5	35.7	39.3	**41.2**	36.8	32.5	29.1	27.2
8 layers	36.0	33.7	35.9	**36.4**	33.4	29.5	27.0	25.0

Water temp 60°C

plaster	1m	5m	10m	15m	20m	25m	30m	35m
16 layers	**52.0**	47.0	43.0	**43.7**	41.0	35.5	33.9	31.5
12 layers	**50.4**	40.6	39.1	**41.6**	40.0	35.8	32.2	30.9
8 layers	**46.8**	37.4	37.8	**37.7**	36.5	31.7	29.4	27.7

Layers of padding

Water temp 20°C - 16 layers of plaster

padding	1m	5m	10m	15m	20m	25m	30m	35m
3 layers	21.8	21.4	25.0	32.2	**36.5**	32.4	30.2	29.6
2 layers	22.7	22.6	28.1	36.9	**37.1**	33.2	29.4	27.3
1 layer	20.7	20.9	25.0	32.8	**34.5**	32.8	29.9	27.7

Water temp 20°C - 12 layers of plaster

padding	1m	5m	10m	15m	20m	25m	30m	35m
3 layers	20.2	21.6	25.4	27.7	**31.5**	30.9	28.5	26.2
2 layers	19.6	20.2	23.9	30.2	**32.0**	30.5	27.4	25.3
1 layer	21.2	20.8	24.4	30.5	**31.7**	30.2	27.6	25.7

Water temp 20°C - 8 layers of plaster

padding	1m	5m	10m	15m	20m	25m	30m	35m
3 layers	21.6	21.6	23.2	29.1	**31.2**	28.8	25.8	23.4
2 layers	21.8	21.4	23.8	30.0	**31.4**	29.1	26.0	23.2
1 layer	20.6	20.7	22.9	25.5	**29.0**	27.5	24.9	22.6

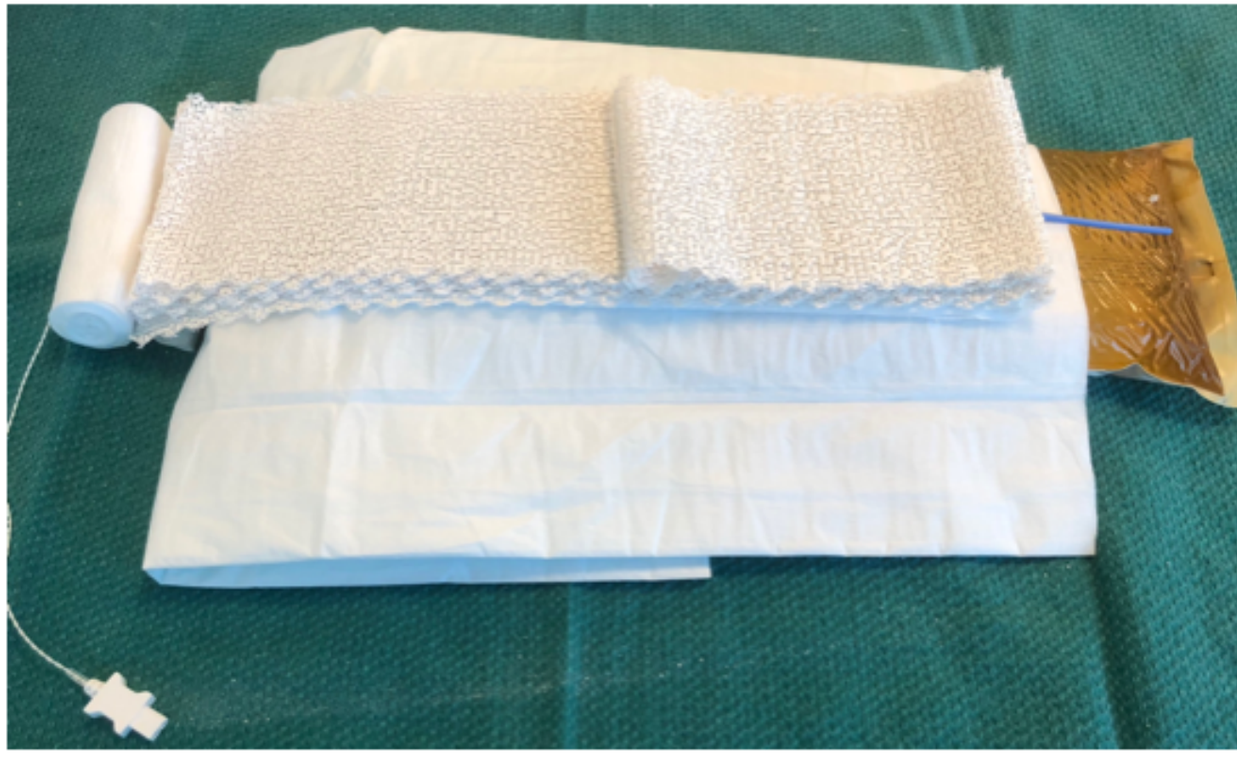
Ventilation

Water temp 20°C - covered with 2 layers of blankets-1

plaster	1m	5m	10m	15m	20m	25m	30m	35m
16 layers	20.6	23.5	27.4	34.2	**37.8**	33.6	31.9	30.2
12 layers	20.4	22.2	26.9	28.3	**32.3**	30.9	29.1	27.6
8 layers	20.5	21.1	23.2	29.4	**31.8**	29.6	26.3	24.7

Water temp 20°C - no blankets

plaster	1m	5m	10m	15m	20m	25m	30m	35m
16 layers	21.8	21.4	25.0	32.2	**36.5**	32.4	30.2	29.6
12 layers	20.2	21.6	25.4	27.7	**31.5**	30.9	28.5	26.2
8 layers	21.6	21.6	23.2	29.1	**31.2**	28.8	25.8	23.4



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Discussion

- Peak temperature at 15-20 minutes
- Higher water temperature and thicker plasters -> higher plaster temperatures
- Inadequate ventilation -> small increase in temperature
- Thickness of padding - no difference

- **Recommendations**
  - minimum thickness of plaster for the required strength of the plaster
  - cold dipping water
  - keep plaster uncovered until set
  - sufficient padding for comfort/avoidance of pressure areas
  - be aware of patients with poor circulation, tourniquet use, regional blocks

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