# Mohs surgery

2012-1019

1200+ cases

# Mohs surgery

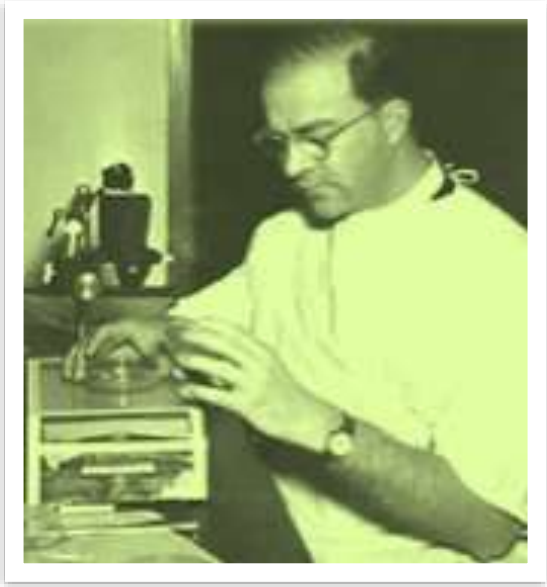
- What is it?
- Why cannot we live without it?
- What are the benefits and risks?
- What are the outcomes?
- Who should get Mohs surgery?

# Concerns and misconceptions

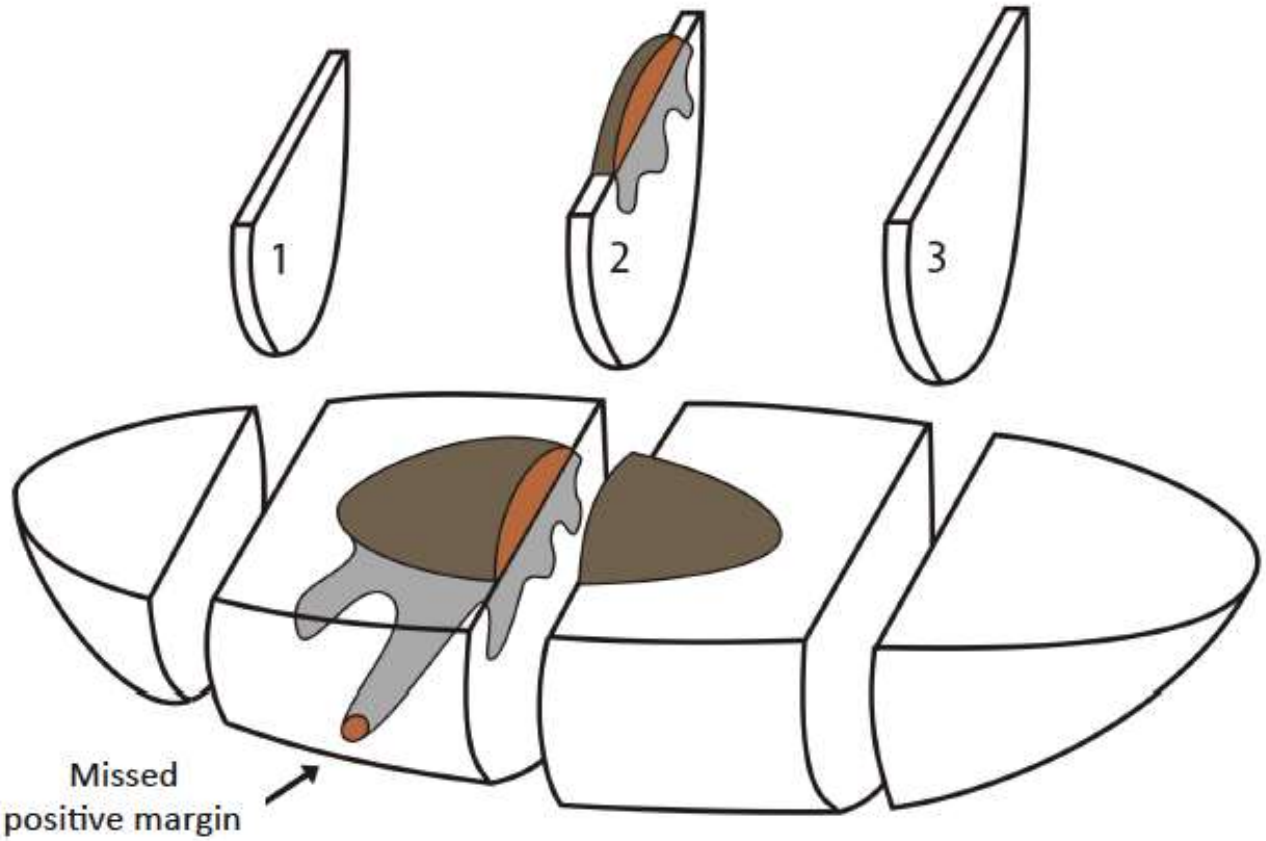
- Not really better than surgical excision
- Too cumbersome and expensive; we have no ressources to do it
- Dermatologists cannot do sophisticated surgery; better to send to plastic surgeons
- Patients do not want surgery; there is a high risk of unsightly scar in the face
- Histopathology is too complex and dermatologists will have a problem with interpreting Mohs slides
- Surgery is not safe
- Recurrence in BCC does not matter, we just treat recurrent tumors again and everybody is happy.

# What is Mohs surgery?

- Established by *Frederic E. Mohs* in 1941
- Not M.O.H.S. or Moh's or or Moh…
- But
  - M – micrographic
  - O – optimal outcome
  - H – histologic control
  - S – smallest possible defect
- The essence of Mohs surgery that the WHOLE margin of the excised tumor is histologically examined and tumor "left-overs" can be mapped and re-excised



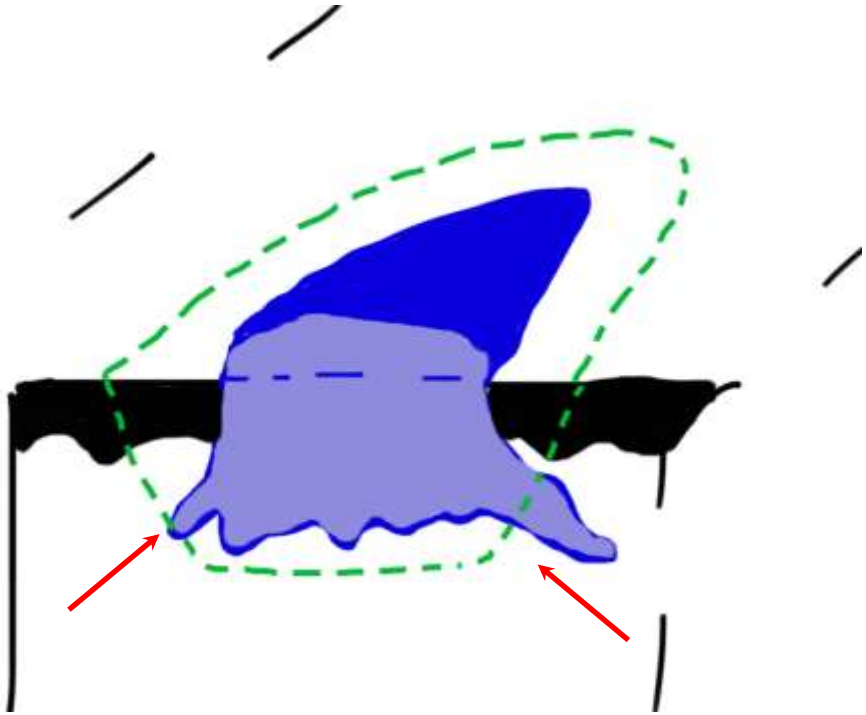
# Standard pathology examines only 1% of the margin

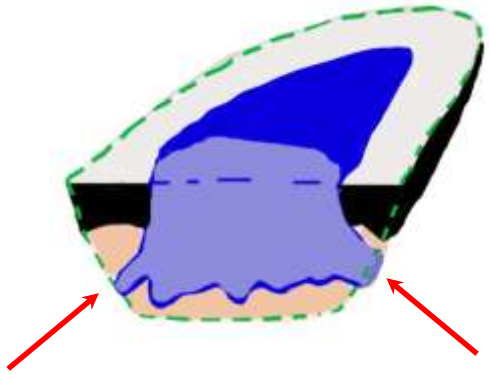


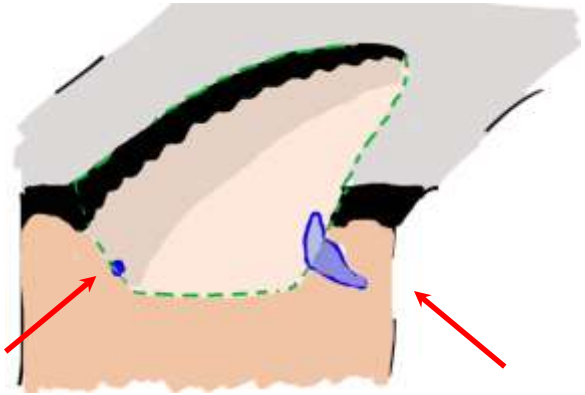
# In Mohs surgery 100% of the margin is examined microscopically

- Tumor is excised
- The specimen is flattened and frozen
- Horizontal sections from the bottom

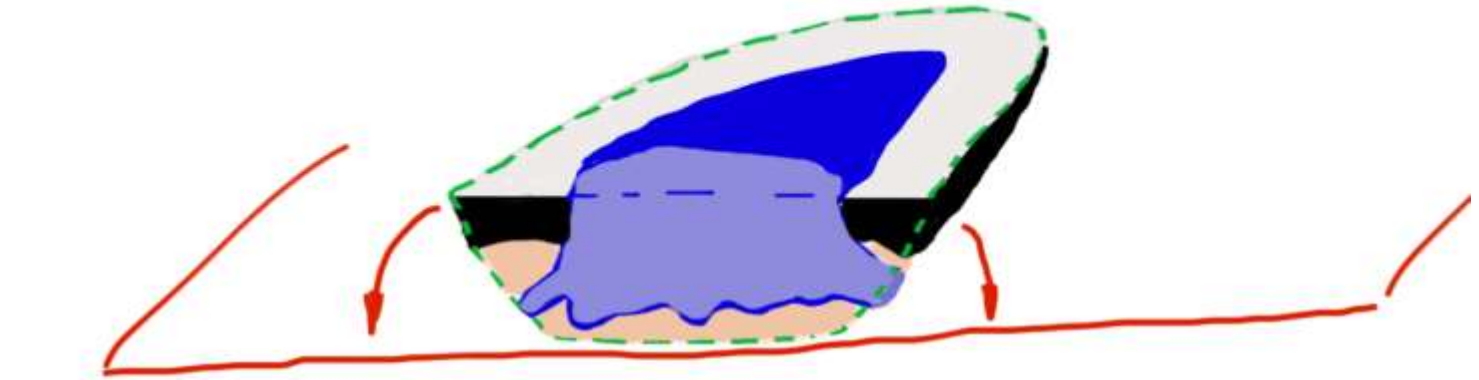
# Excision with 45º angle

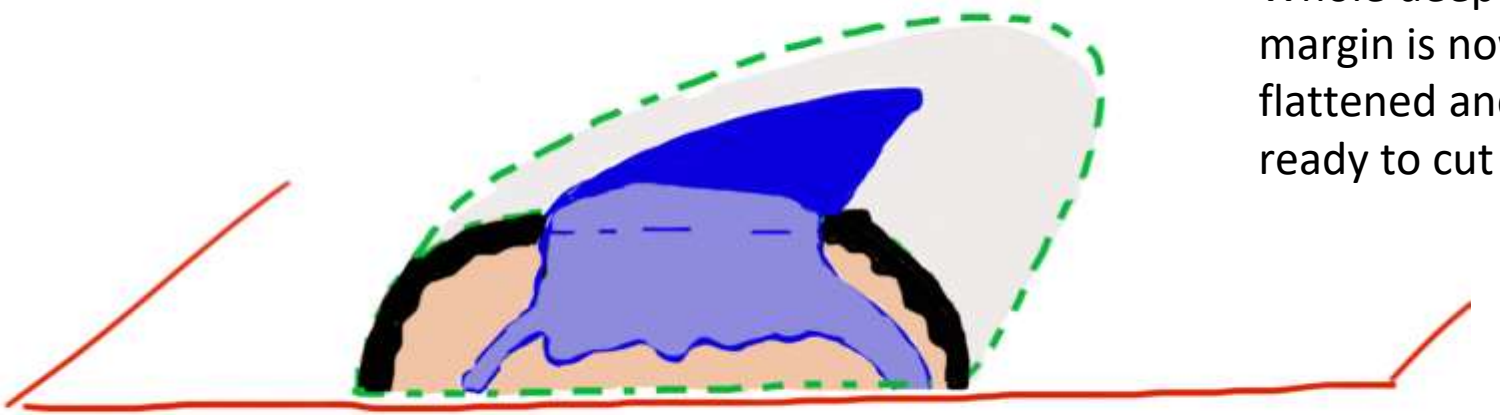






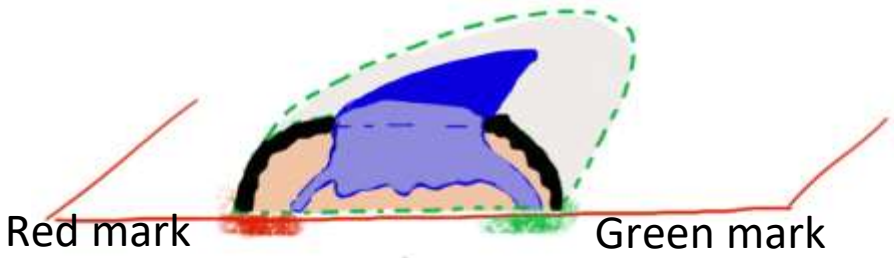
# Coloring and flattening of the specimen

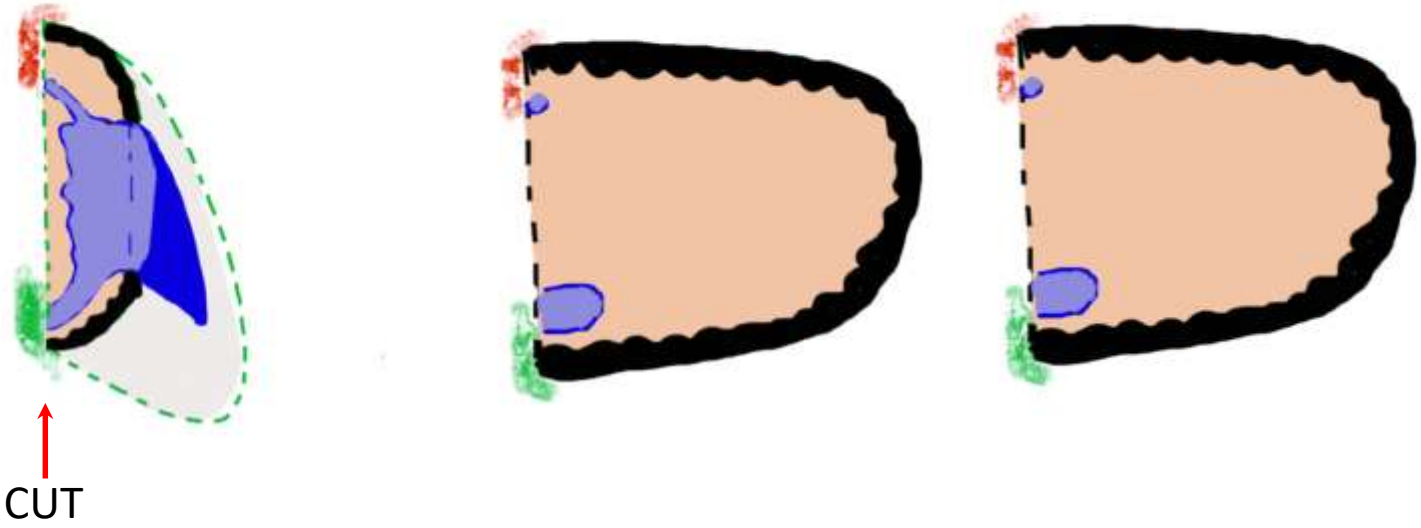




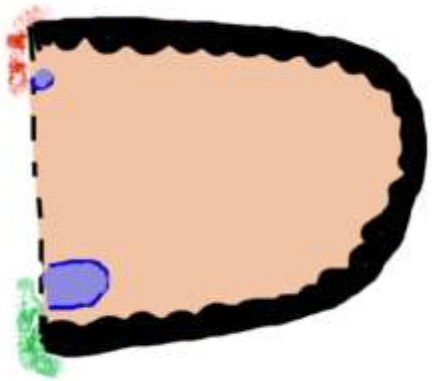
Whole deep margin is now flattened and ready to cut

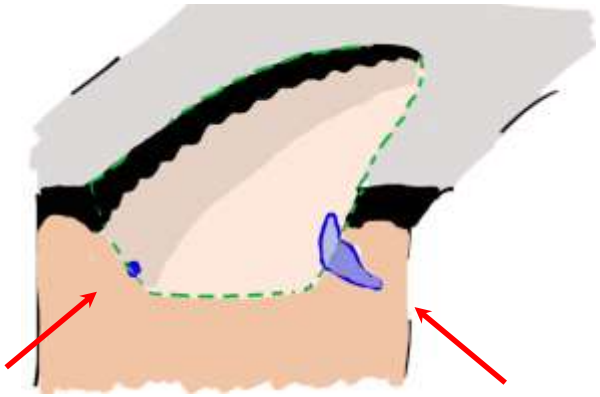
# Marking, cutting, interpretation

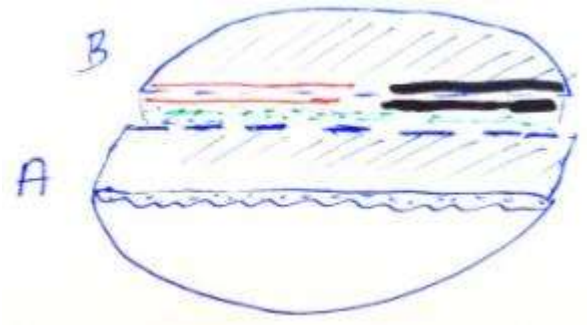


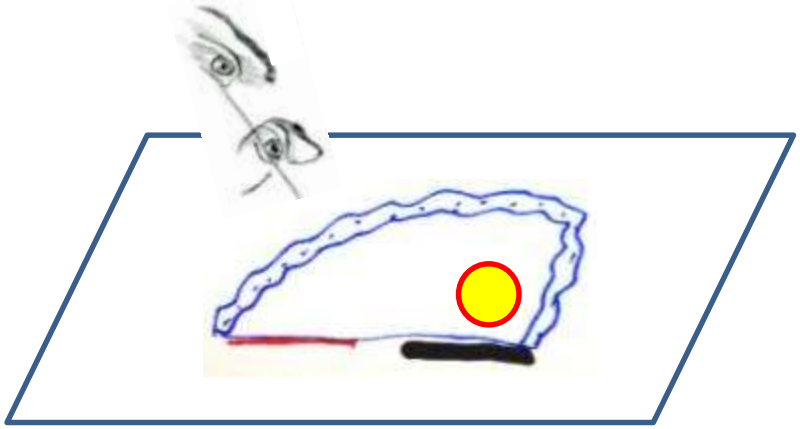



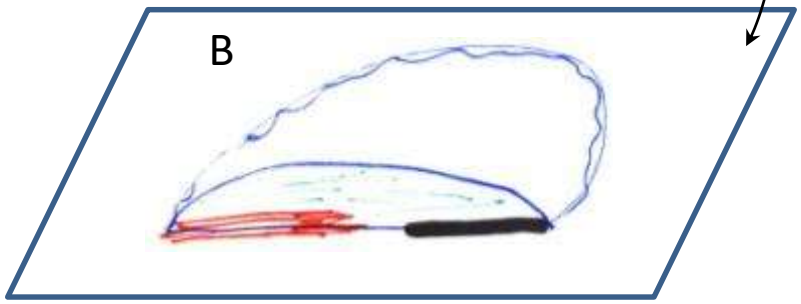
# Reexcision

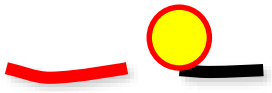






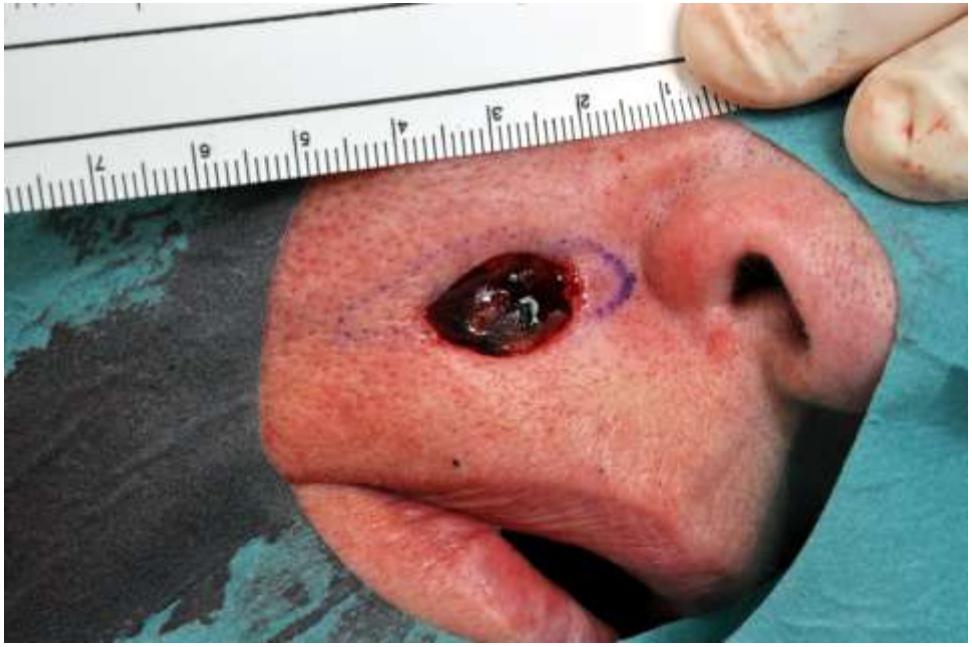


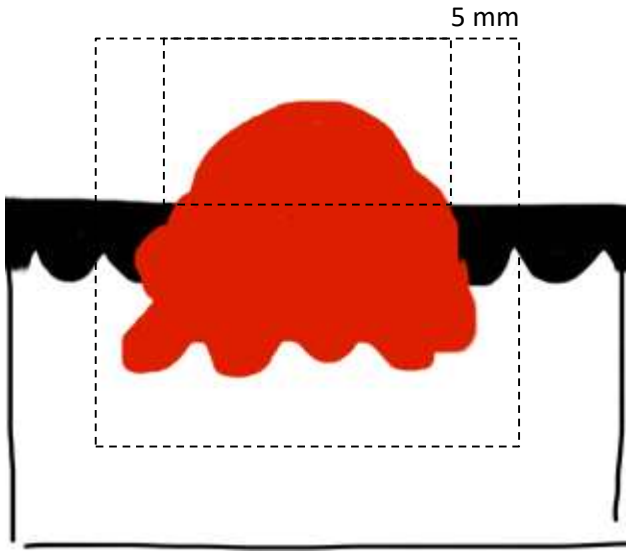
Skæres fra bunden

# Histologi, segment A; HE

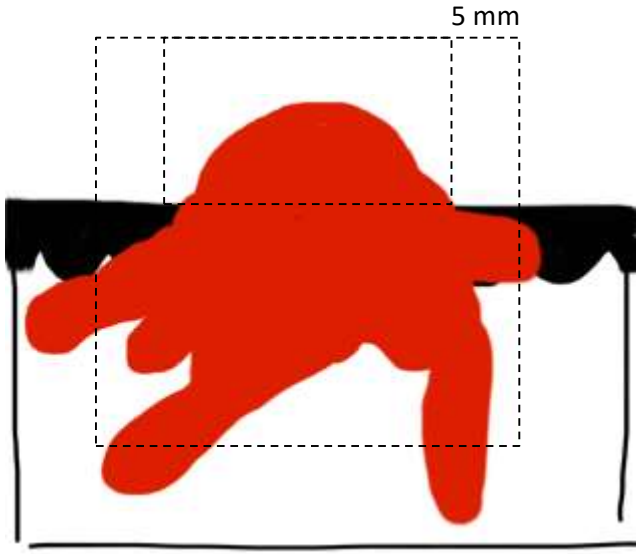
effective margin 2 mm



# Growth pattern of BCC




Symmetric growth pattern
Often low-risk carcinomas
5 mm boders will eradicate the tumor in 95% cases




Asymmetric, aggressive growth pattern
High risk carcinomas and a subset of low-risk BCC
5 mm borders are insufficient in up to 50% cases

# Margins in high-risk tumors

**Højrisikotumorer** (>2 cm eller aggressiv histologi (mikronodulær, infiltrativ, morfeaform, basosquamous), uskarpt afgrænset, recidiv)

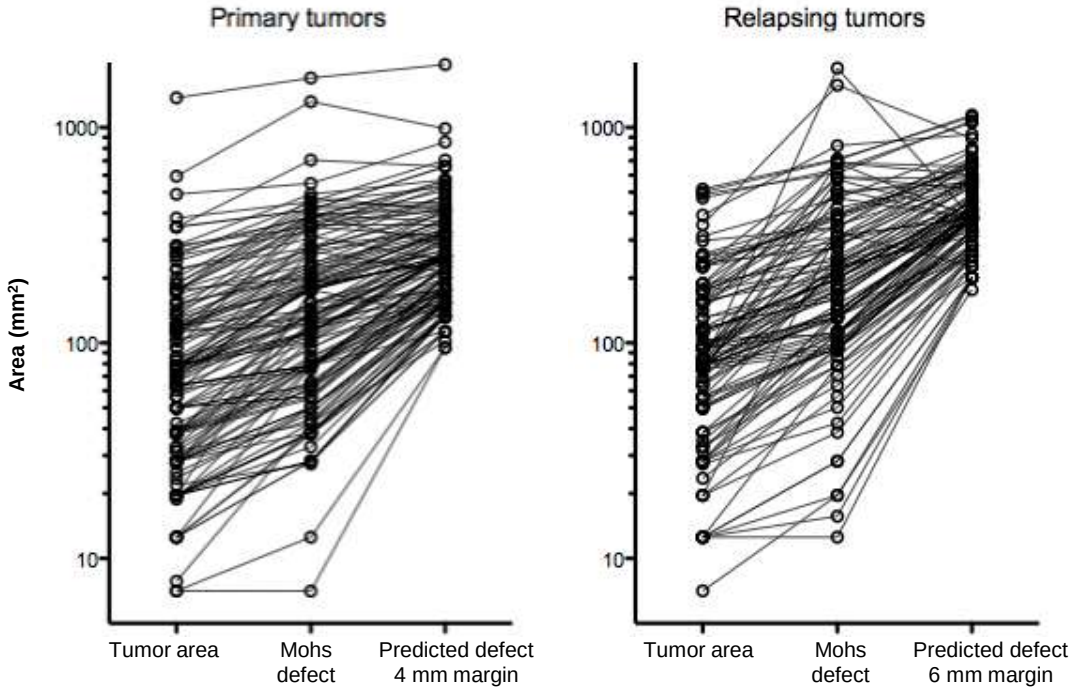
**Estimeret tumorfri margin i >95% tilfælde:**

| FAKTOR | aggressiv histologi | benign histologi |
|---|---|---|
| < 1cm | 6.5 mm | 4 mm |
| 1-2 cm | 8.5 mm | 6 mm |
| >2 cm | 13 mm | 11 mm |
| high-risk område | 11 mm | 6 mm |
| recidiv | 11 mm | 7 mm |

Breuninger & Dietz . J Derm Surg Oncol 1991,17:574
Hendrix et al. Der, Surg 1996;22:535-9

# MMS is tissue saving

n=856




Gniadecki, Glud, unpublished

# How superior is MMS?

# 95% complete excisions

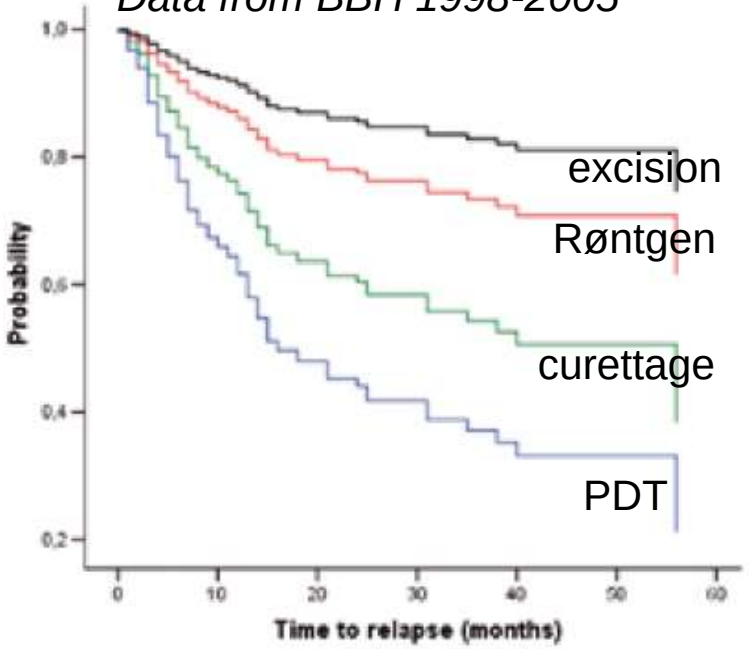
| | Low risk | High risk |
|---|---|---|
| BCC | 5 mm | 8 mm |
| SCC | 5 mm | 14 mm |

Based on the micrographic analysis of 495 tumors

Schell et al. 20113: JAMA Facial Plast Surg 15:337

# Incomplete excisions and insensitive pathology explains high relapse rate of BCC

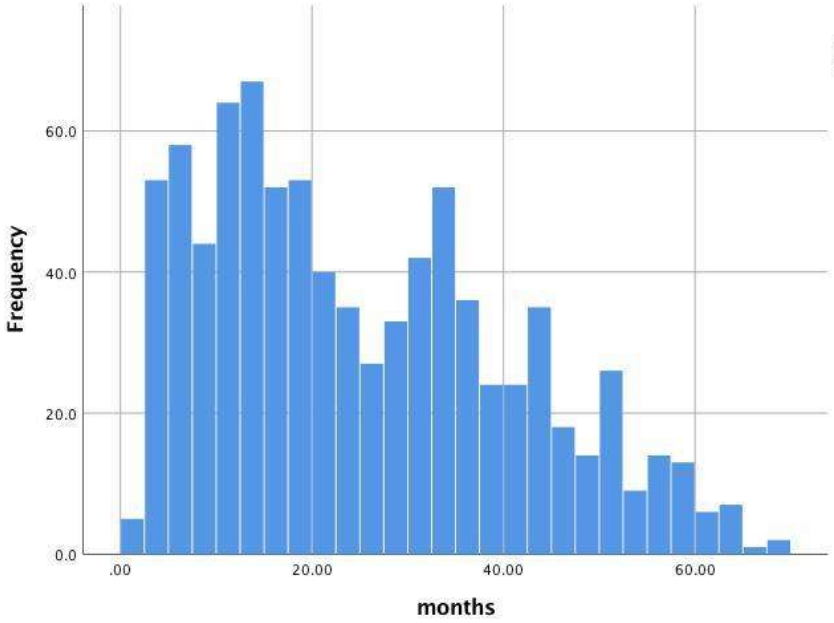
*Data from BBH 1998-2005*

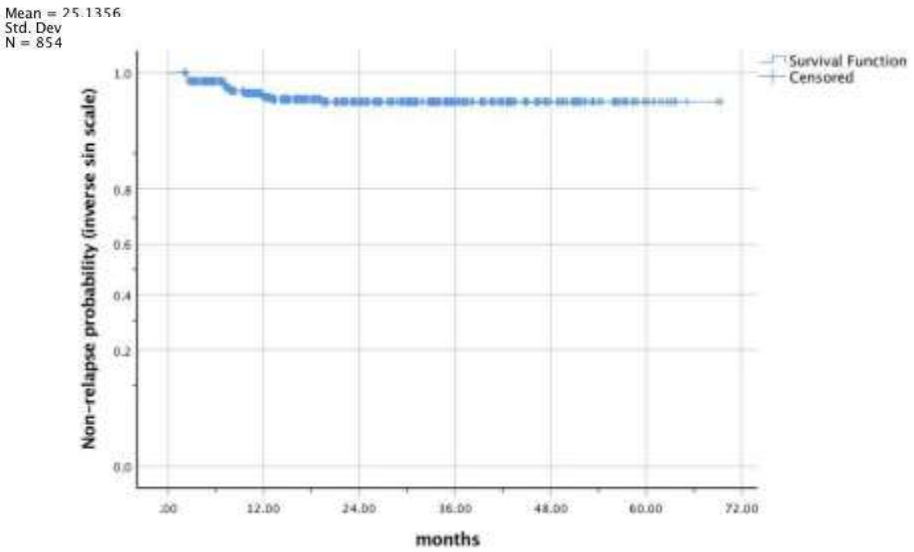



| Mohs surgery | Primary | Recurrent |
|---|---|---|
| Rowe et al. 1989 (metaanalysis) | 99 % | 94.4 % |
| Paoli et al (2011) | 97.9 % | 94.8 % |
| Leibovitch 2005 | 98.6 % | 96% |

Bøgelund, Philipsen, Gniadecki. Acta Derm Venereol 2007

# BBH data MMS




9 cases of tumor recurrence (1.1%)

3 of those were previous recurrences

6 were primary tumors

No obvious site predilection (temple n=2, periorbital n=1, ala nasi n=2, forehead, n=2, scalp=1, cheek n=1)

All recurrences happened at mean 10.3 months after initial surgery (range 7.2-19.6 months).

# Surgical excision versus Mohs' micrographic surgery for primary and recurrent basal-cell carcinoma of the face: a prospective randomised controlled trial with 5-years' follow-up

Klara Mosterd, Gertruud A M Krekels, Fred H M Nieman, Judith U Ostertag, Brigitte A B Essers, Carmen D Dirksen, Peter M Steijlen, Anton Vermeulen, H A M Neumann, Nicole W J Kelleners-Smeets

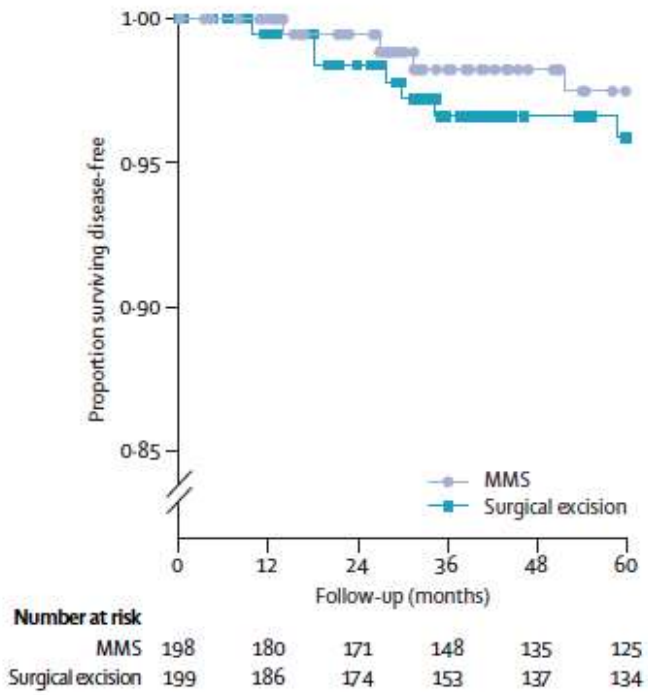
## Summary

**Background** Basal-cell carcinoma (BCC) is the most common form of skin cancer and its incidence is still rising

*Lancet Oncol* 2008; 9: 1149-56

**204 MMS**
**204 surgical excision**
**margin**

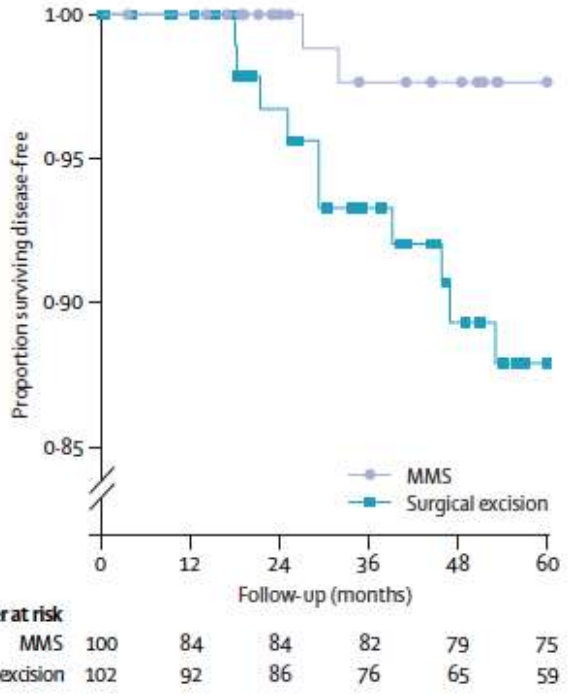
all




| Number at risk | | | | | | |
|---|---|---|---|---|---|---|
| MMS | 198 | 180 | 171 | 148 | 135 | 125 |
| Surgical excision | 199 | 186 | 174 | 153 | 137 | 134 |

**Difference: 6.5 %**

recurrent




| Number at risk | | | | | | |
|---|---|---|---|---|---|---|
| MMS | 100 | 84 | 84 | 82 | 79 | 75 |
| Surgical excision | 102 | 92 | 86 | 76 | 65 | 59 |

**Difference: 13.5 %**

European Journal of Cancer (2014) 50, 3011–3020

Available at www.sciencedirect.com

ScienceDirect

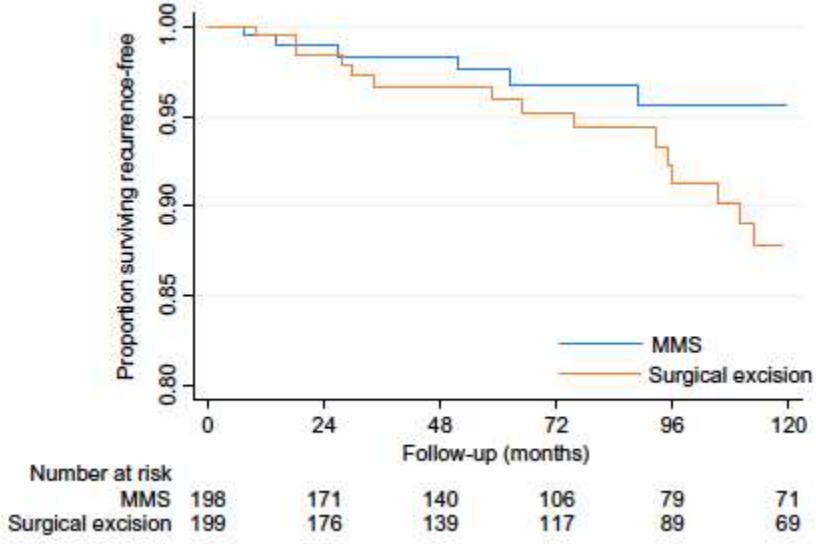
journal homepage: www.ejcancer.com

Clinical Trial

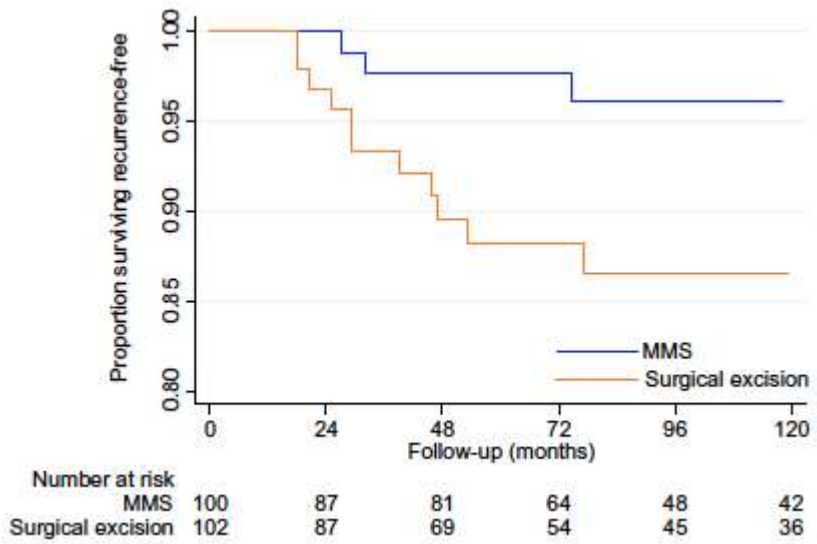
# Surgical excision versus Mohs' micrographic surgery for basal cell carcinoma of the face: A randomised clinical trial with 10 year follow-up ☆

Eva van Loo [a], Klara Mosterd [b,c], Gertruud A.M. Krekels [b,d], Marieke H. Roozeboom [b,c], Judith U. Ostertag [b,e], Carmen D. Dirksen [f], Peter M. Steijlen [b,c,g], H.A. Martino Neumann [b,h], Patty J. Nelemans [i,1], Nicole W.J. Kelleners-Smeets [b,c,g,*,1]

all

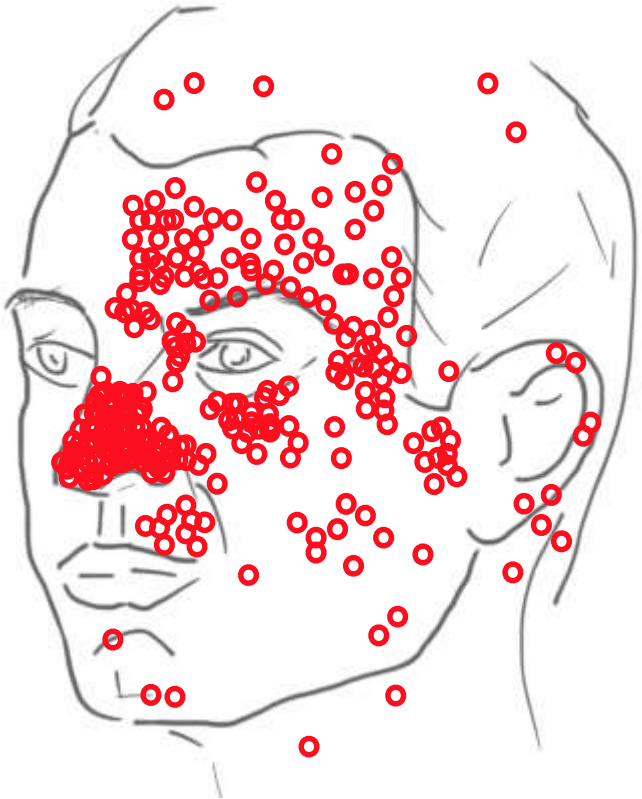


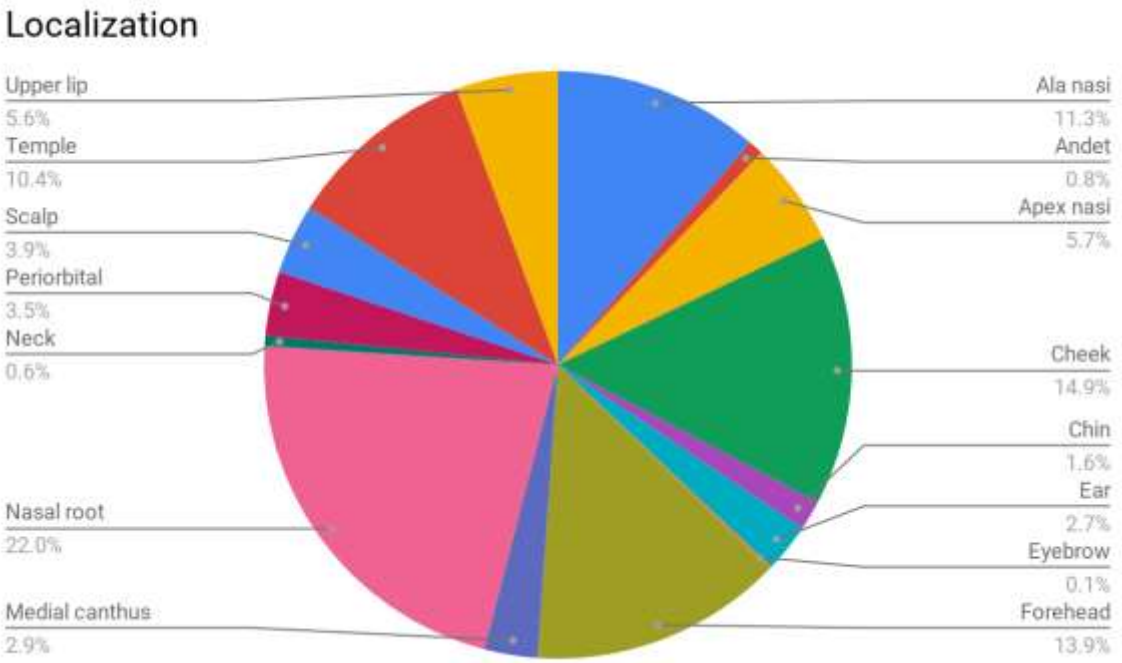

recurrent



# Is MMS also cosmetically superior?

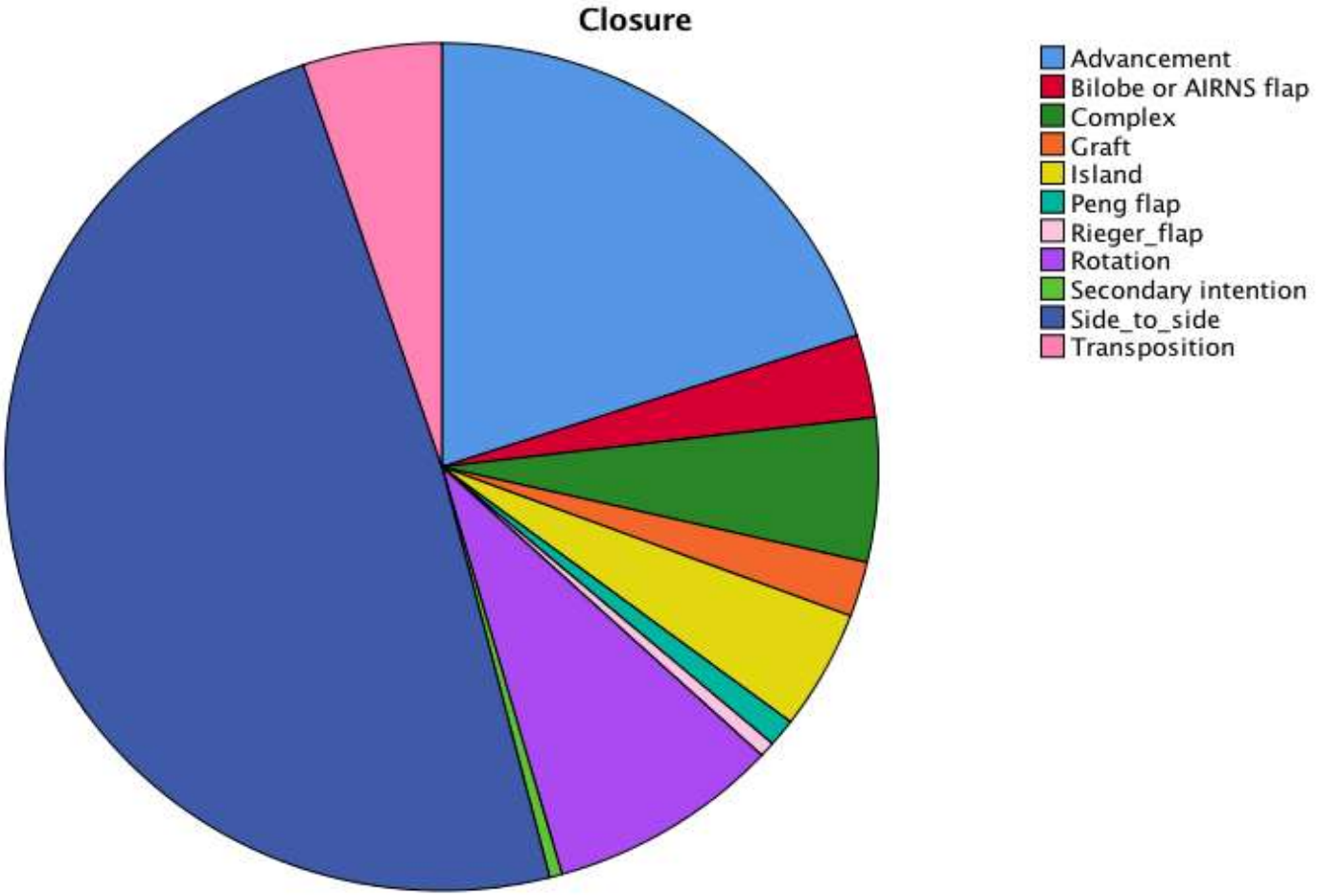
n=856

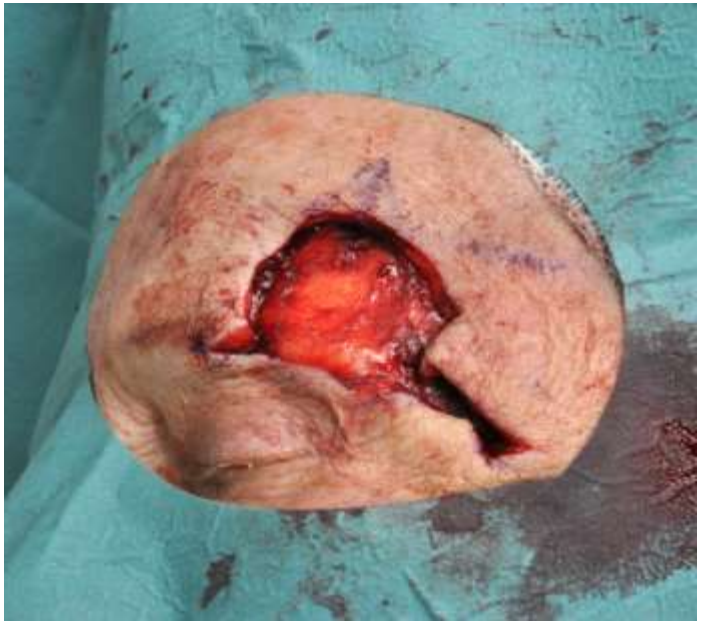





Gniadecki, R. *et al.* Favourable results of Mohs micrographic surgery for basal cell carcinoma. *Dan. Med. J.* **62**, A5171 (2015).
and unpublished data

# Closures


Closure
Advancement
Bilobe or AIRNS flap
Complex
Graft
Island
Peng flap
Rieger_flap
Rotation
Secondary intention
Side_to_side
Transposition



# Concerns and misconceptions

- Not really better than surgical excision
- Dermatologists cannot do sophisticated surgery; better to send to plastic surgeons
- Patients do not want surgery; there is a high risk of unsightly scar in the face
- **Too cumbersome and expensive; we have no ressources to do it**
- **Histopathology is too complex and dermatologists will have a problem with interpreting Mohs slides**
- **Surgery is not safe**
- **Recurrence in BCC does not matter, we just treat recurrent tumors again and everybody is happy.**

# Safety

- In our material out of 1200 patients only a few complications
  - hematoma (n=4; all on blood thinners + flap closure on the cheek)
- Infections are are (2.1%) and non-serious (nose surgery close to nostril)
- Literature
  - Excellent safety: max 3% minor complications
  - <0.05% major complications

(Merritt et al. JAAD 2012;67:1302; Alam et al. JAMA Derm 2013;149:1378)

# The issue of the cost (in Europe)

| | Mohs surgery | Simple excision |
|---|---|---|
| Primary BCC | € 1.248 | € 990 |
| Recurrent BCC | € 1.284 | € 1043 |
| Cost effectiveness (difference in cost/difference in efficacy) | € 2.345 | € 3.171 |

Mosterd et al. Lancet Oncol 2008;9:1149

# Can dermatologists reliably do Mohs surgery?

- 95% of Mohs is performed by dermatologists
- High reliability i reading histopathology: Concordance  99.4% with a pathologist. There is no added value to involve a histopathologist during surgery

Semkova et al. Derm Surg 2013;39:1648

# The burden of relapsing tumors

## Cost

- 2017 - 13,000 new cases of BCC.
- 20% relapse rate gives approx 3,000 new tumors over 5 years (x€900 = < €2,700,000)
- (40% of tumors treated with MMS are recurrent)

## Recurrent tumors are more aggressive

- 20% originally nonaggressive BCCs became aggressive during recurrence (BJD 2004;151:623-6)
- 31% originally aggressive BCCs showed a more aggressive component during recurrence.

# Empowerment by MMS

- MMS is enormously enjoyable to perform. It is the best treatment, the approach is rational and outcomes excellent.
- Empowerment to perform more sophisticated surgery.
- Opens possibility to collaborate with other specialties (plast surg, ophtalmology, ENT) on a partnership basis

# so, should we only do Mohs and forget other options?

of course not

# MMS in Europe

- ESMS certification: 100 cases under supervision. Training centers: 500+ cases
- Europe: certified centers in Belgium, Cyprus, France, Germany, Netherlands, Portugal, Romania, Spain, Switzerland, UK
- BBH: 15 cases per week; 500 cases/year; 1200+ cases; Team: 2 surgeons + 1 in training, 3 nurses, 2 technicians
- Other centers in Scandinavia (cases/year): Stockholm (25); Lund (40); Gothenburg (90); Oslo (80)


2012: 60 cases / year
2018: 500 cases / year