

Trombektomier ur ett kliniskt och historiskt perspektiv

Regional strokeforskningsdag

24 oktober 2023

Petra Redfors

Överläkare

Neurologen

SU/Sahlgrenska

Hur behandlas akut stroke idag?

- Och hur var behandlingen för 25 år sedan??

Akut stroke – 1998 och 2023



Kvinna 60 år
drabbas av
strokesymtom
I Göteborg, kl
02.00. Senast
frisk kl 00.00

Akut stroke - 2023



Anhörig
ringer 112

Akut stroke - 1998

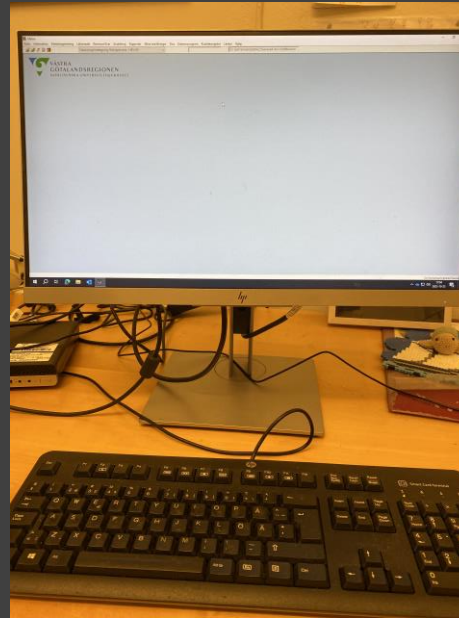


Anhörig
ringer 90 000

Akut stroke - 2023



Ambulans anländer snabbt. (Prio 1) Gör modifierad NIHSS som är 12.
Vänstersidiga symtom.
Ringer trombolysjour
Sahlgrenska
Beslut strokelarm

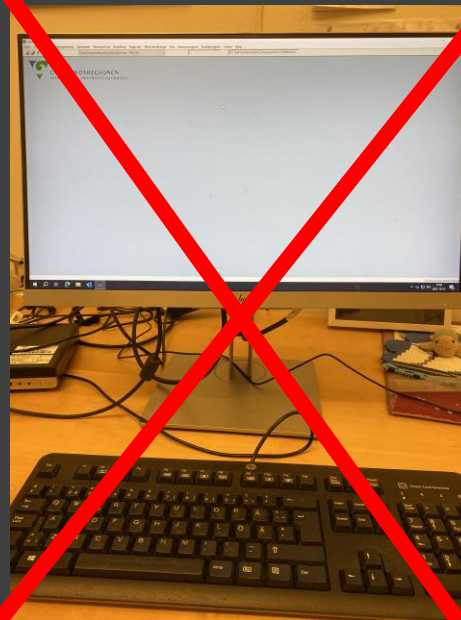


Trombolysjour
Sahlgrenska kontrollerar kontraindikationer och medicinering i melior och NPÖ

Akut stroke - 1998



~~Ambulans anländer
snabbt (Prio 1) Gör
modifierad NIHSS som
är 12.
Vänstersidiga symptom.
Ringer trombolysjour
Sahlgrenska~~

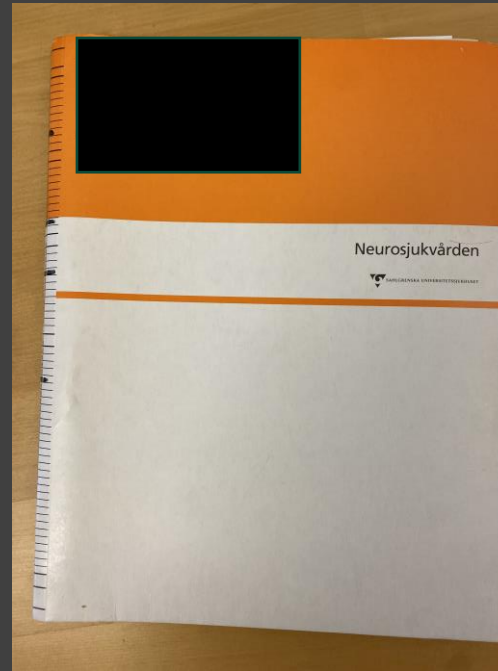


~~Trombolysjour
Sahlgrenska kontrollerar
kontraindikationer och
medicinering i melior
och NPÖ~~

Akut stroke -1998



Ambulans anländer
efter lång tid (timmar?).
Undersöker. Förstår att
kvinnan har en stroke.
Kör till
akutmottagningen



Primärjour neurologi
lyckligt (??) ovetandes
om patienten

Akut stroke - 2023

Strokalarm



Kl 03:00

All personal möts på CT-lab. CT körs efter någon minut. Neurologjour undersöker och pat har minst NIHSS 15 poäng. Inga kontraindikationer trombolys

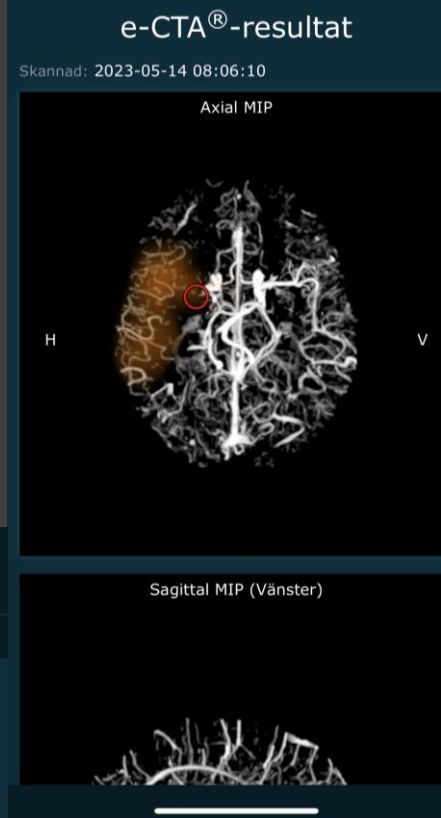
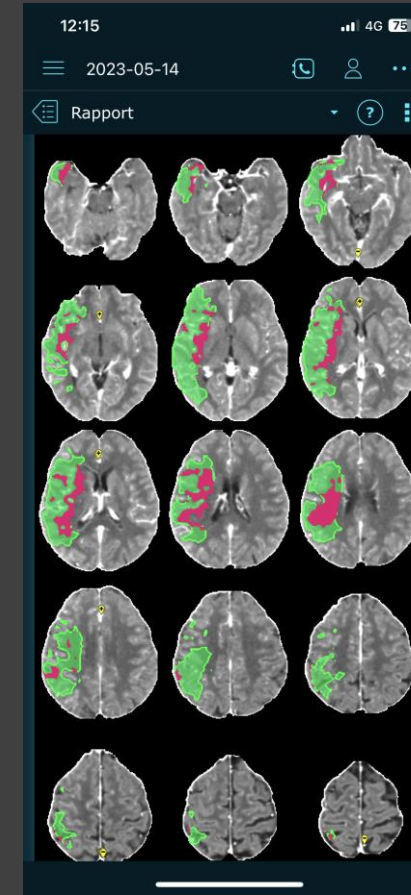
TROMBOLYS!
Bolus ges efter 11 minuter! (kl 03:11)

Akut stroke - 2023

Strokelarm



Ct- a CT -perf bilder
granskas av radiolog.
Brainomixappen som
trombolysjouren har i
sin mobil indikerar
storkärlsocklusion.



Akut stroke - 2023

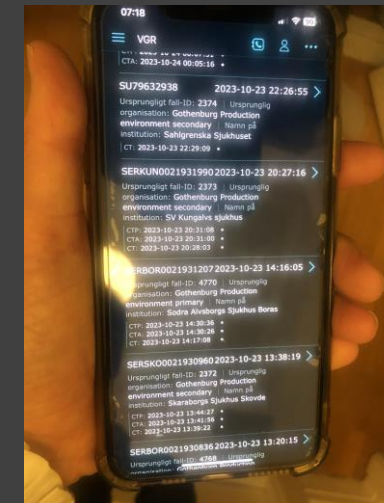
Trombektomilarm



Trombolysjour
kommunicerar med
strokebakjour och
neurointerventionsjour



Teamet förbereder sig
på neurointervention



Akut stroke - 2023



Efter 28 minuter på sjukhus är propp utdragen (kl 03:28)



Akut stroke - 1998



Patient anländer till akutmottagningen.(kl 04:00) Neurologjour tittar på patienten efter att ha bedömt två andra patienter (kl 06:00)

Akut stroke - 1998



Efter flera timmar
flyttas patienten till
vårdavdelning (kl
07:30) Väntar på
CT hjärna

Akut stroke - 1998



CT hjärna görs kl
09:30. Pat får
uppladdningsdos
ASA

Akut stroke - 2023



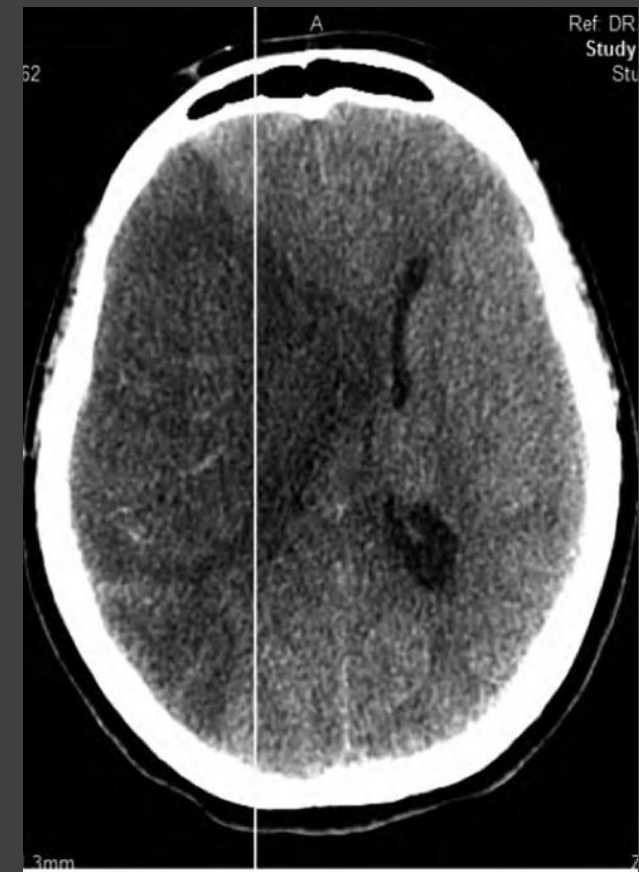
Kl 17 samma dag:
Pat på strokeavdelning.
Besök av anhöriga.
Pat lätt kvarvarande
facialis pares vä, lätt
svaghet i vä hand.
Annars helt återställd.
Pat går hem dag 3 utan
hjälp.

Akut stroke - 1998



48 tim efter LSW
Patienten sjunker i
vakenhet

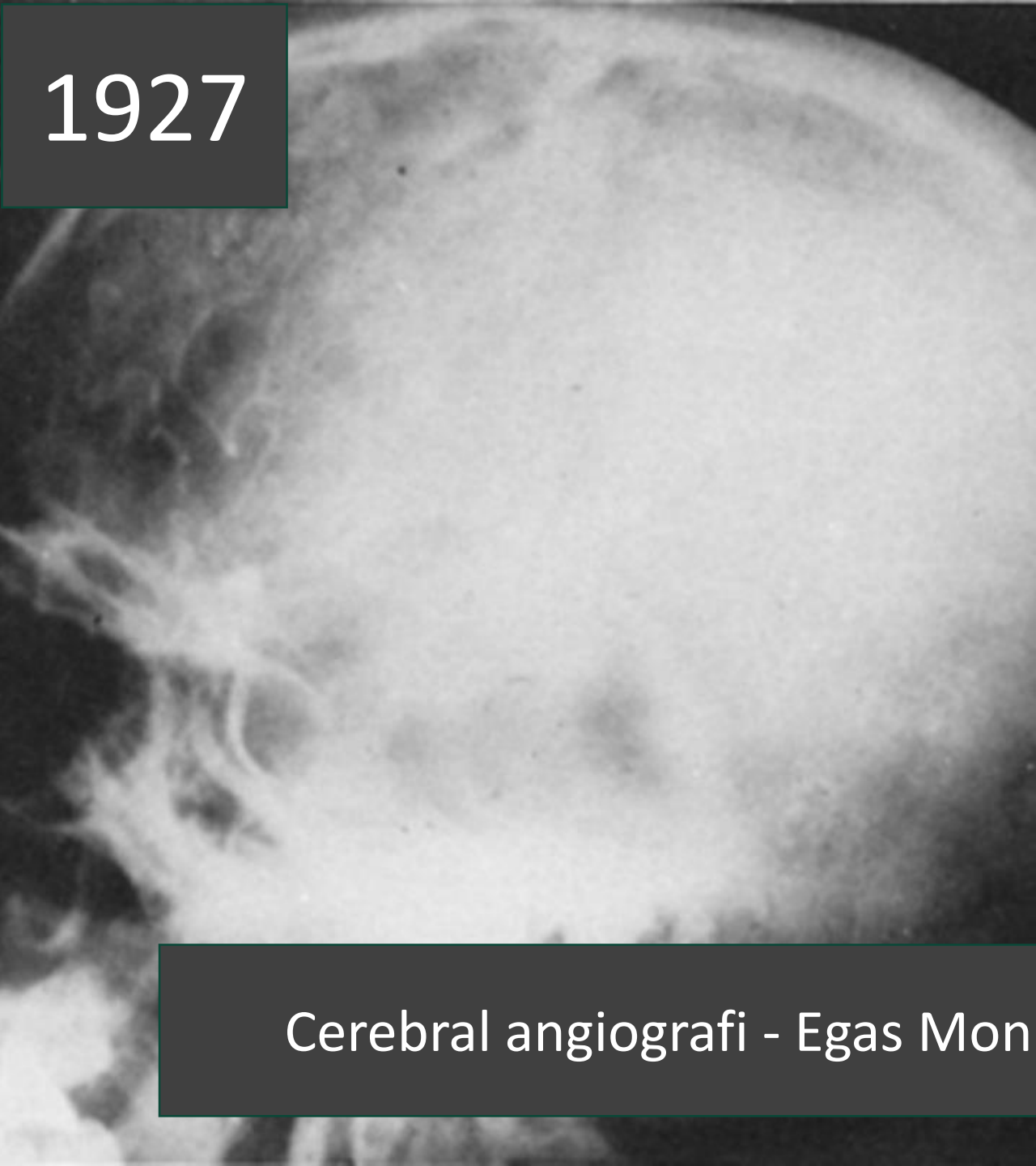
Akut stroke -1998



CT visar malign
mediainfarkt
Neurokirurg
accepterar inte för
kraniektomi
Pat avlider efter 5
dygn

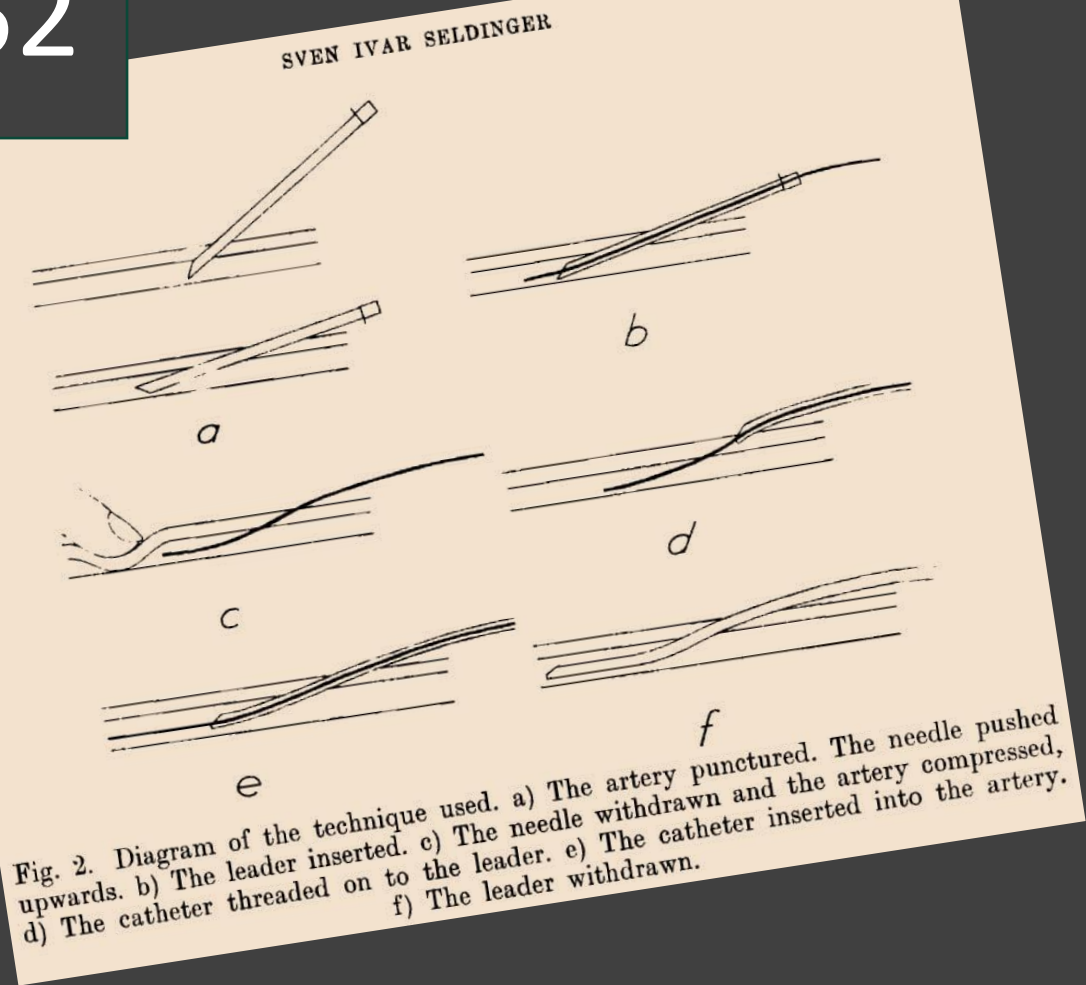


1927



Cerebral angiografi - Egas Moniz

1952

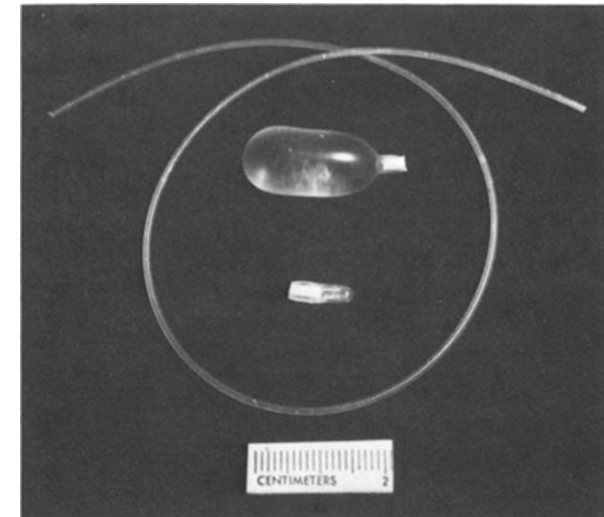
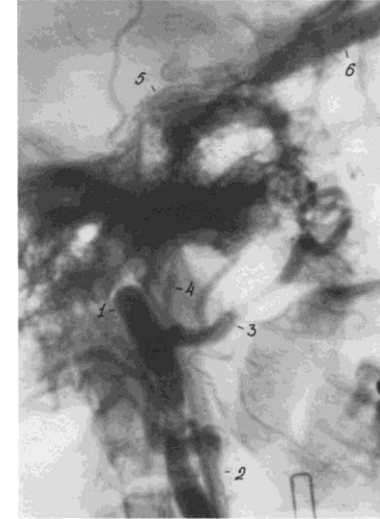


Seldingerteknik – byte över ledare
Sven Ivar Seldinger

1969



Fedor Serbinenko – Den interventionella
neurokirurgins fader



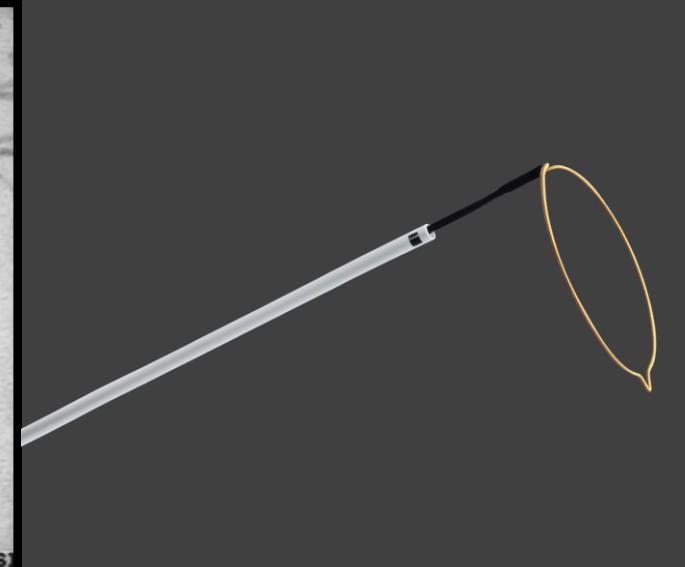
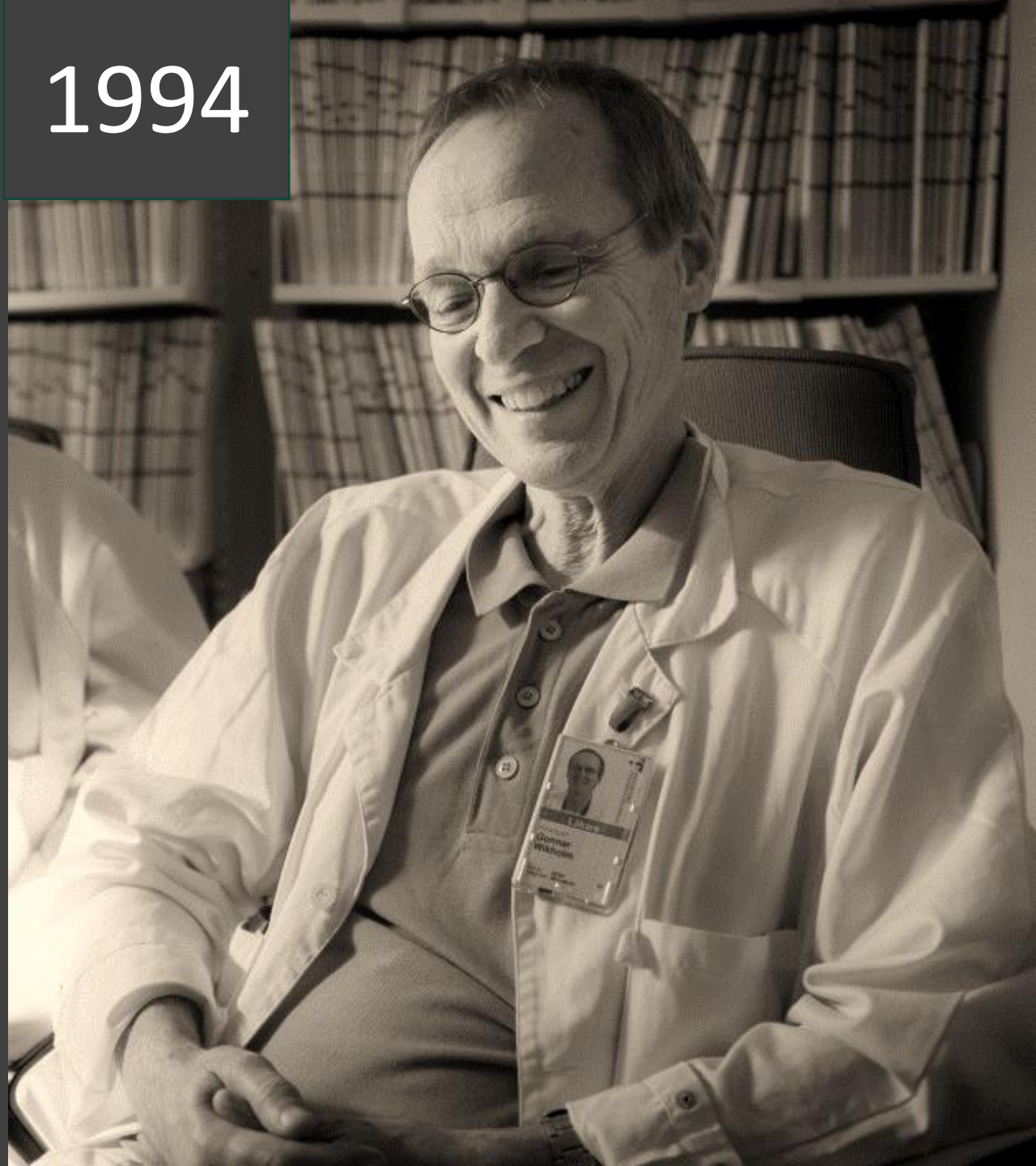
1978



Pål Svendsen – Grundare av
neurointervention Sahlgrenska

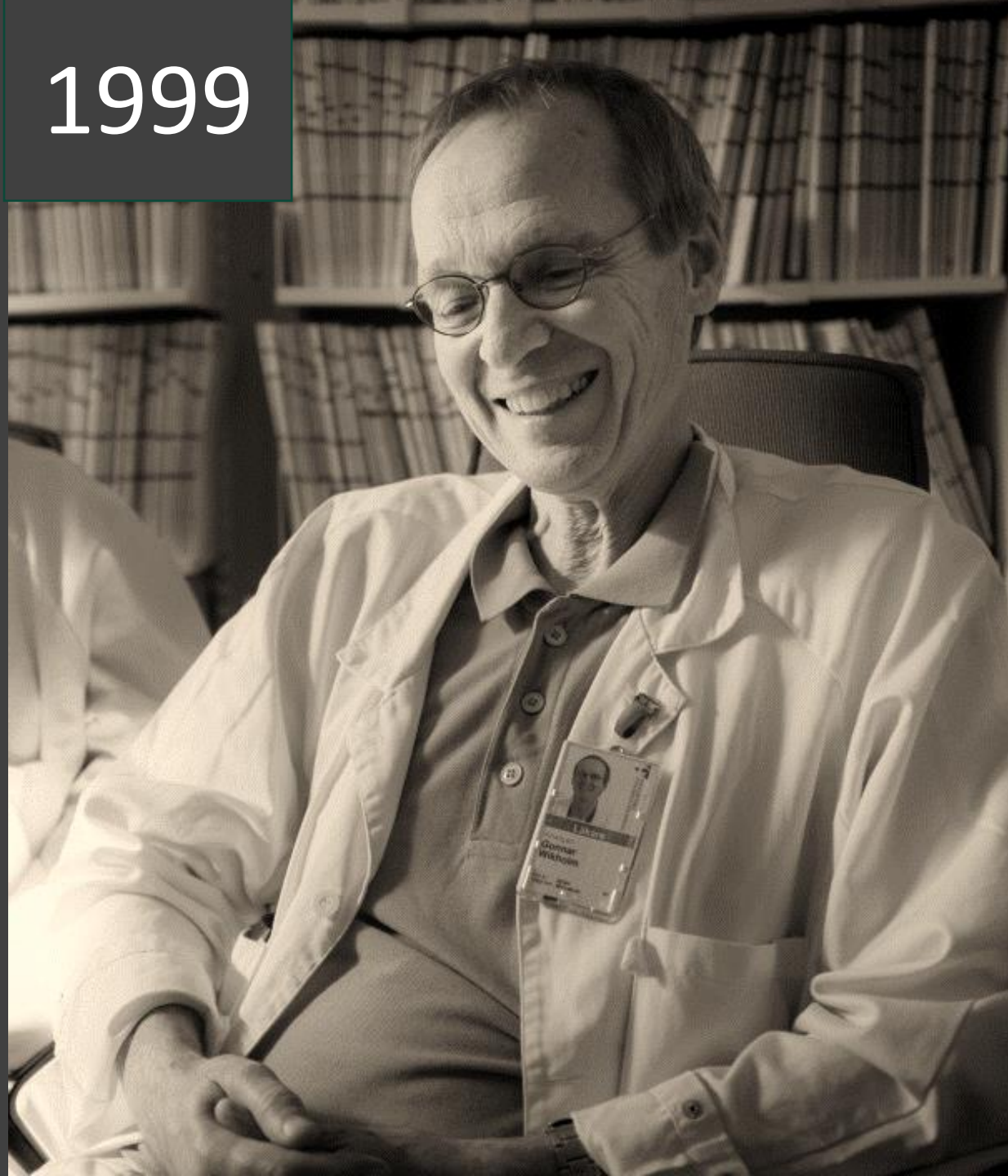


1994



Första trombektomin
i världen på Sahlgrenska

1999



Mechanical Intracranial Embolectomy A Report of Two Cases

G. WIKHOLM

Interventional Neuroradiology, Sahlgrenska University Hospital; Göteborg, Sweden

Key words: cerebral embolism, embolectomy, cardiomyopathy, subarachnoid haemorrhage

Summary

Cerebral ischaemia due to thrombo-embolic complications of intracranial endovascular therapy remains one of the more obvious hazards of this otherwise rather gentle treatment. In this connection the time factor is usually well controlled and the possibility to achieve a good result from thrombolysis are possibly better⁷. To directly extract an embolus mechanically would be an attractive alternative.

This has so far been hampered by the lack of suitable tools. The use of a microsnare intended for intravascular retrieval of foreign bodies like displaced coils or broken catheters shown here must further encourage development of specially designed "thrombectomy devices" for intracranial use. Such a tool may well have an impact on the treatment of noniatrogenic emboli as well.

lyse emboli even when the embolus is a complication to embolisation and the time factor is well controlled³. Often the embolus comes out of a thrombo-embolic complication without deficit but there is a need for rapid revascularisation than chemical thrombolysis usually can offer. Fragmentation of a thrombus by repeatedly pushing a catheter through it or by forced injections of thrombolytics into the thrombus has also been utilized⁵.

These methods leave a multitude of embolic fragments carried peripherally. These fragments have a much larger surface available for thrombolysis than the original intact embolus thereby possibly making recanalisation more efficient. A more attractive and rapid method would be to extract the entire embolus mechanically. There have not as yet been specially designed tools for such operation on the cerebral vasculature but since the increased demand innovators and

Introduction

1995

- Trombolys godkänt USA 1996 (3 tim)
- Trombolys godkänt Europa 2003

The New England Journal of Medicine

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DECEMBER 14, 1995

THE PLASMINOGEN ACTIVATOR FOR ACUTE ISCHEMIC STROKE

INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE t-PA STROKE STUDY GROUP*

d. Thrombolytic therapy for acute ischemic stroke has been approached cautiously because of the risk of intracerebral hemorrhage. We performed a randomized, double-blind, controlled trial of intravenous recombinant tissue plasminogen activator (alteplase) for acute ischemic stroke after recent pilot studies had shown that t-PA was beneficial when treatment was begun within three hours of the onset of stroke. The study had two parts. Part 1 (in which 291 patients were enrolled) tested whether t-PA had clinical benefit by an improvement of 4 points over placebo on the score of the National Institutes of Health Stroke Scale (NIHSS) or the resolution of the neurologic deficit within 24 hours of the onset of stroke. Part 2 (in which 333 patients were enrolled) used a global test statistic to assess clinical outcome at three months, according to scores on the Barthel index, modified Rankin scale, Glasgow outcome scale, and NIHSS.

Results. In part 1, there was no significant difference between the group given t-PA and that given placebo in

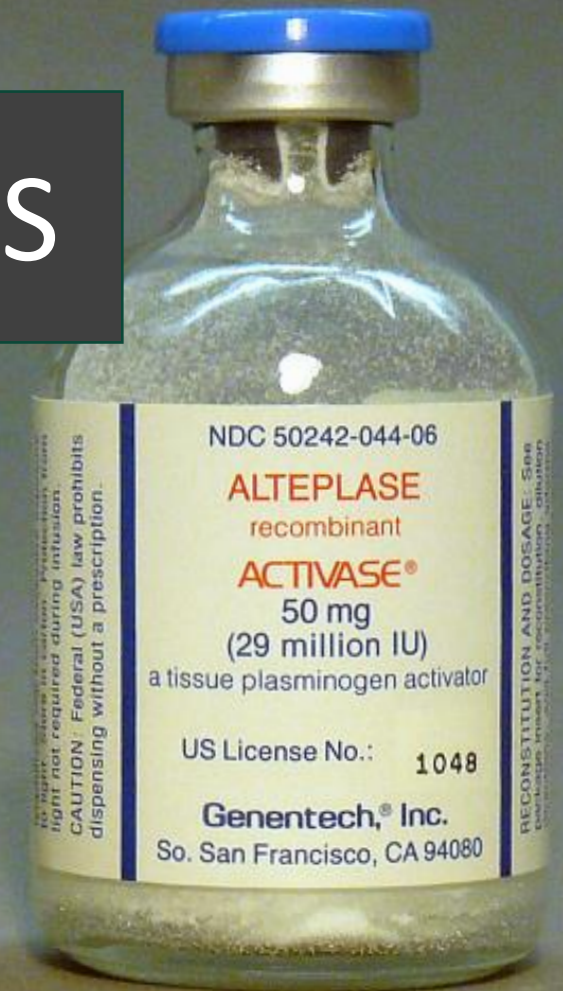
the percentages of patients with neurologic improvement at 24 hours, although a benefit was observed for the t-PA group at three months for all four outcome measures. In part 2, the long-term clinical benefit of t-PA predicted by the results of part 1 was confirmed (global odds ratio for a favorable outcome, 1.7; 95 percent confidence interval, 1.2 to 2.6). As compared with patients given placebo, patients treated with t-PA were at least 30 percent more likely to have minimal or no disability at three months on the assessment scales. Symptomatic intracerebral hemorrhage within 36 hours after the onset of stroke occurred in 6.4 percent of patients given t-PA but only 0.6 percent of patients given placebo ($P < 0.001$). Mortality at three months was 17 percent in the t-PA group and 21 percent in the placebo group ($P = 0.30$).

Conclusions. Despite an increased incidence of symptomatic intracerebral hemorrhage, treatment with intravenous t-PA within three hours of the onset of ischemic stroke improved clinical outcome at three months. (N Engl J Med 1995;333:1581-7.)

ISCHEMIC stroke affects over 400,000 people in the United States annually,¹ and there is no direct treatment to reduce the extent of neurologic injury. Cere-

open-label, dose-escalation studies,^{6,7} which emphasized very early treatment — within 90 and 180 minutes of the onset of the stroke — to reduce the risk of

NINDS



2003

ECASS 3

Trombolys införs på
Sahlgrenska

6

5

4

3

2

1

0



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

SEPTEMBER 25, 2008

VOL. 359 NO. 13

Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke

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ABSTRACT

BACKGROUND

Intravenous thrombolysis with alteplase is the only approved treatment for acute ischemic stroke, but its efficacy and safety when administered more than 3 hours after the onset of symptoms have not been established. We tested the efficacy and safety of alteplase administered between 3 and 4.5 hours after the onset of a stroke.

METHODS

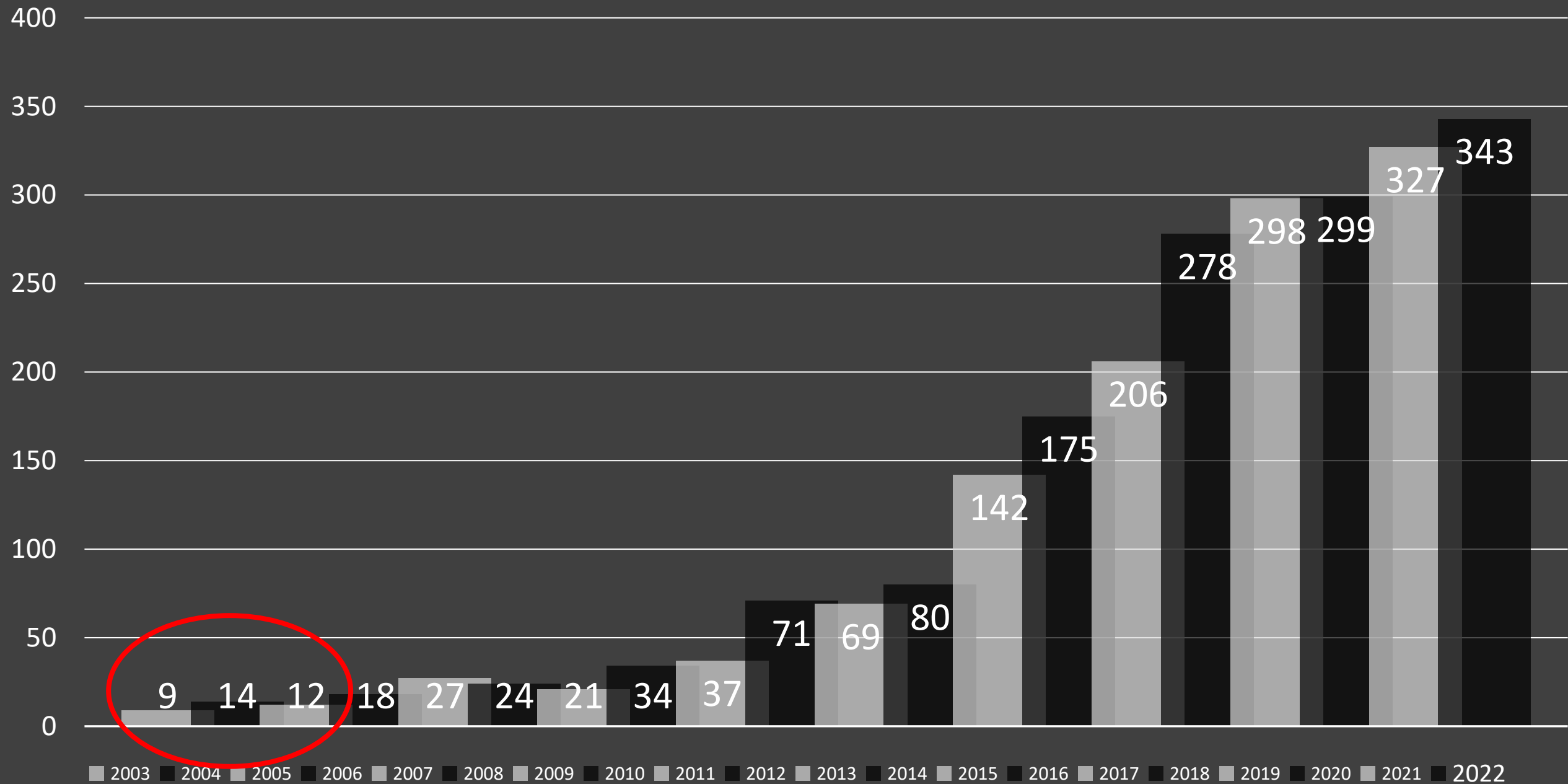
After exclusion of patients with a brain hemorrhage or major infarction, as detected on a computed tomographic scan, we randomly assigned patients with acute ischemic stroke in a 1:1 double-blind fashion to receive treatment with intravenous alteplase (0.9 mg per kilogram of body weight) or placebo. The primary end point was disability at 90 days, dichotomized as a favorable outcome (a score of 0 or 1 on the modified Rankin scale, which has a range of 0 to 6, with 0 indicating no symptoms at all and 6 indicating death) or an unfavorable outcome (a score of 2 to 6 on the modified Rankin scale). The secondary end point was a global outcome analysis of four neurologic and disability scores combined. Safety end points included death, symptomatic intracranial hemorrhage, and other serious adverse events.

RESULTS

We enrolled a total of 821 patients in the study and randomly assigned 418 to the alteplase group and 403 to the placebo group. The median time for the administration of alteplase was 3 hours 59 minutes. More patients had a favorable outcome with alteplase than with placebo (52.4% vs. 45.2%; odds ratio, 1.34; 95% confidence interval [CI], 1.02 to 1.76; $P=0.04$). In the global analysis, the outcome was also improved with alteplase as compared with placebo (odds ratio, 1.28; 95% CI, 1.00 to 1.65; $P<0.05$). The incidence of intracranial hemorrhage was higher with alteplase than with pla-

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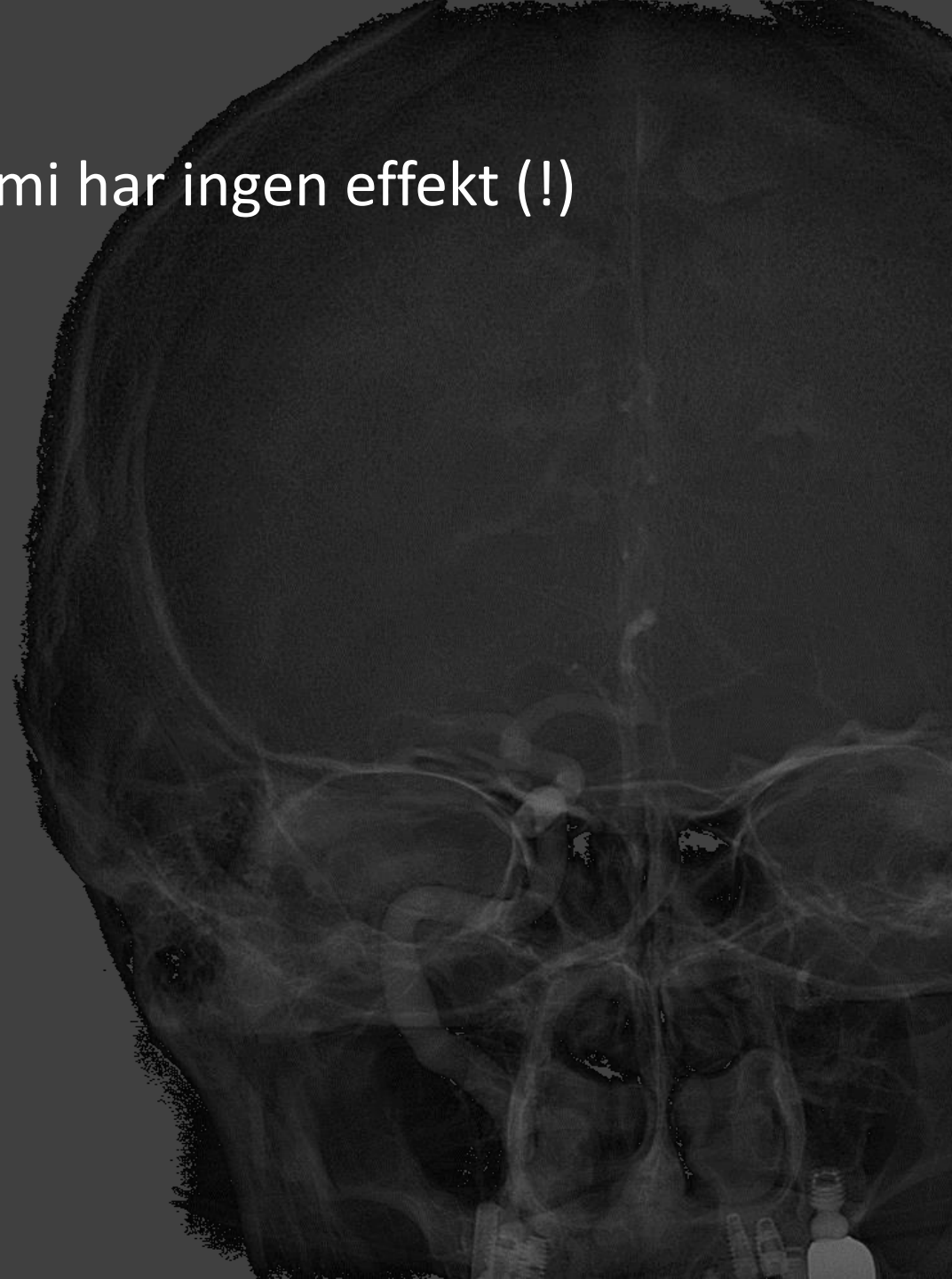
Antal trombektomier/år Sahlgrenska



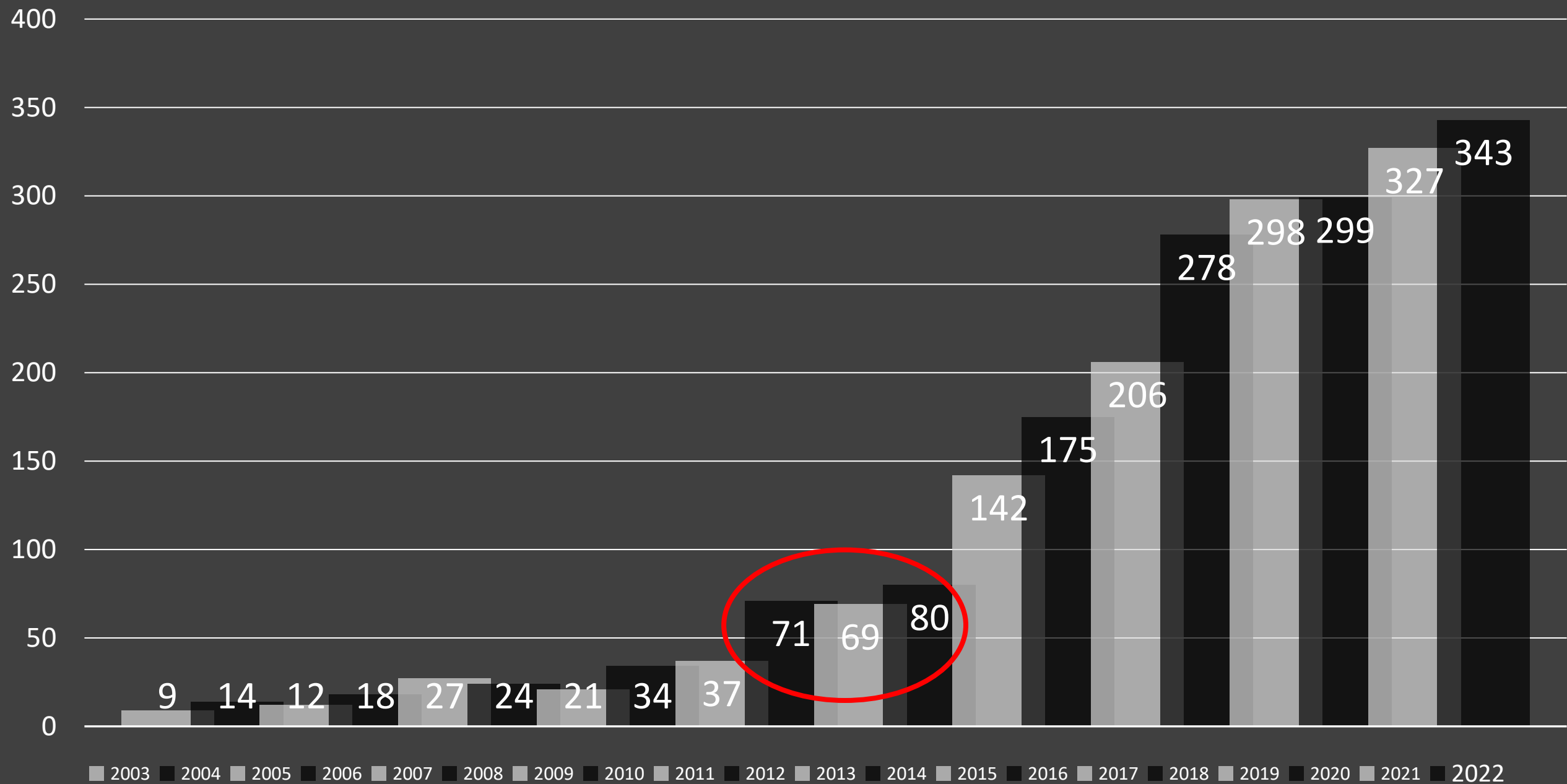
2013

- Trombektomi har ingen effekt (!)

MR RESCUE
SYNTHESIS-EXP
IMS III



Antal trombektomier/år Sahlgrenska



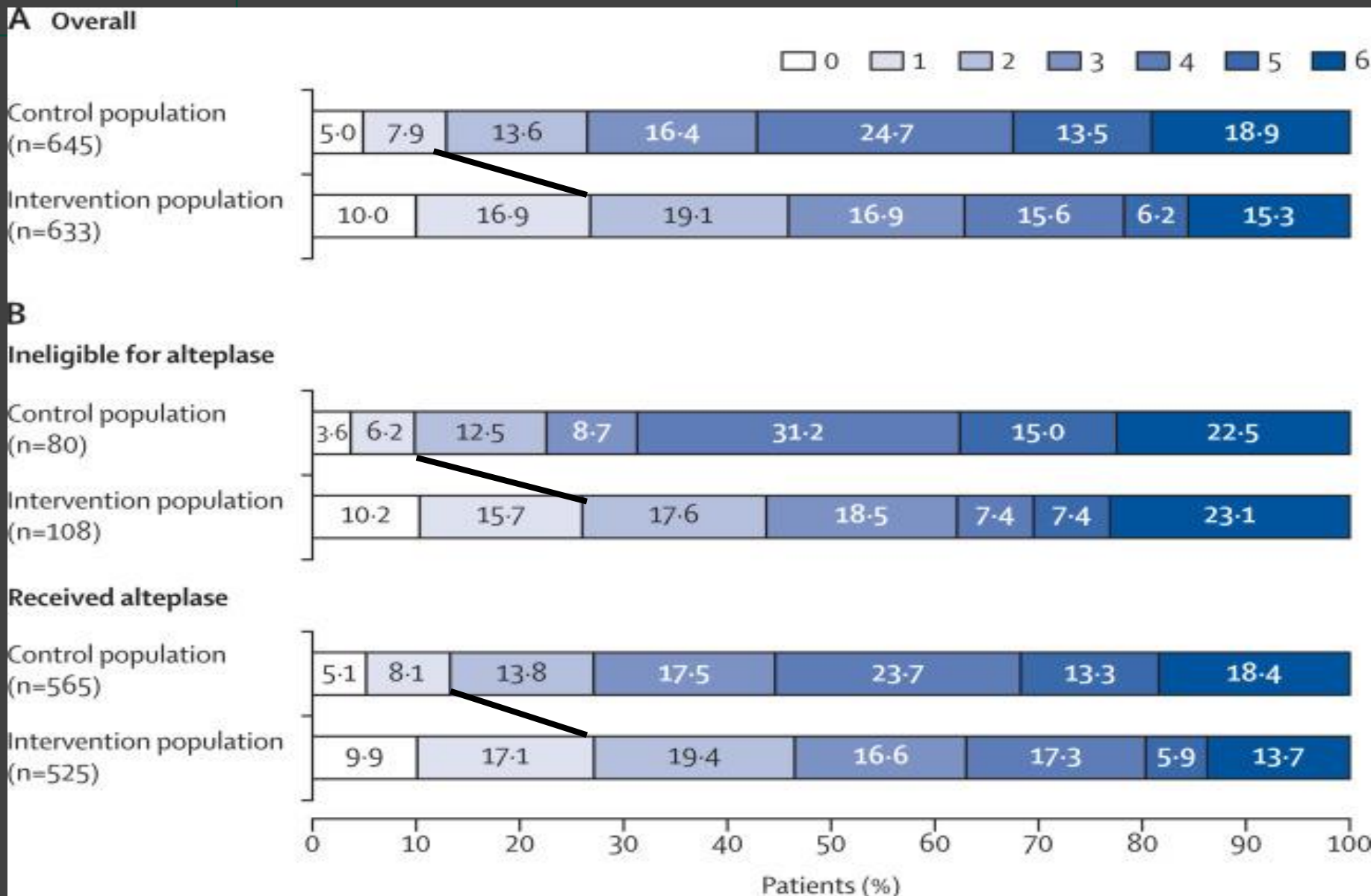
2015

Trombektomi – evidensbaserad metod!

- Trombolys+trombektomi vid verifierade centrala ocklusioner
- A carotis, a media, (a cer ant) 2010-2015 randomiserade multicenterstudier
 - MR CLEAN, ESCAPE, EXTEND IA, SWIFT PRIME, REVASCAT
 - 1287 patienter
 - Trombolys jämfört med
 - Trombolys+Trombektomi <6 (8-12) h

2015

Modified Rankin Scale 0-1 vid 90 dagar



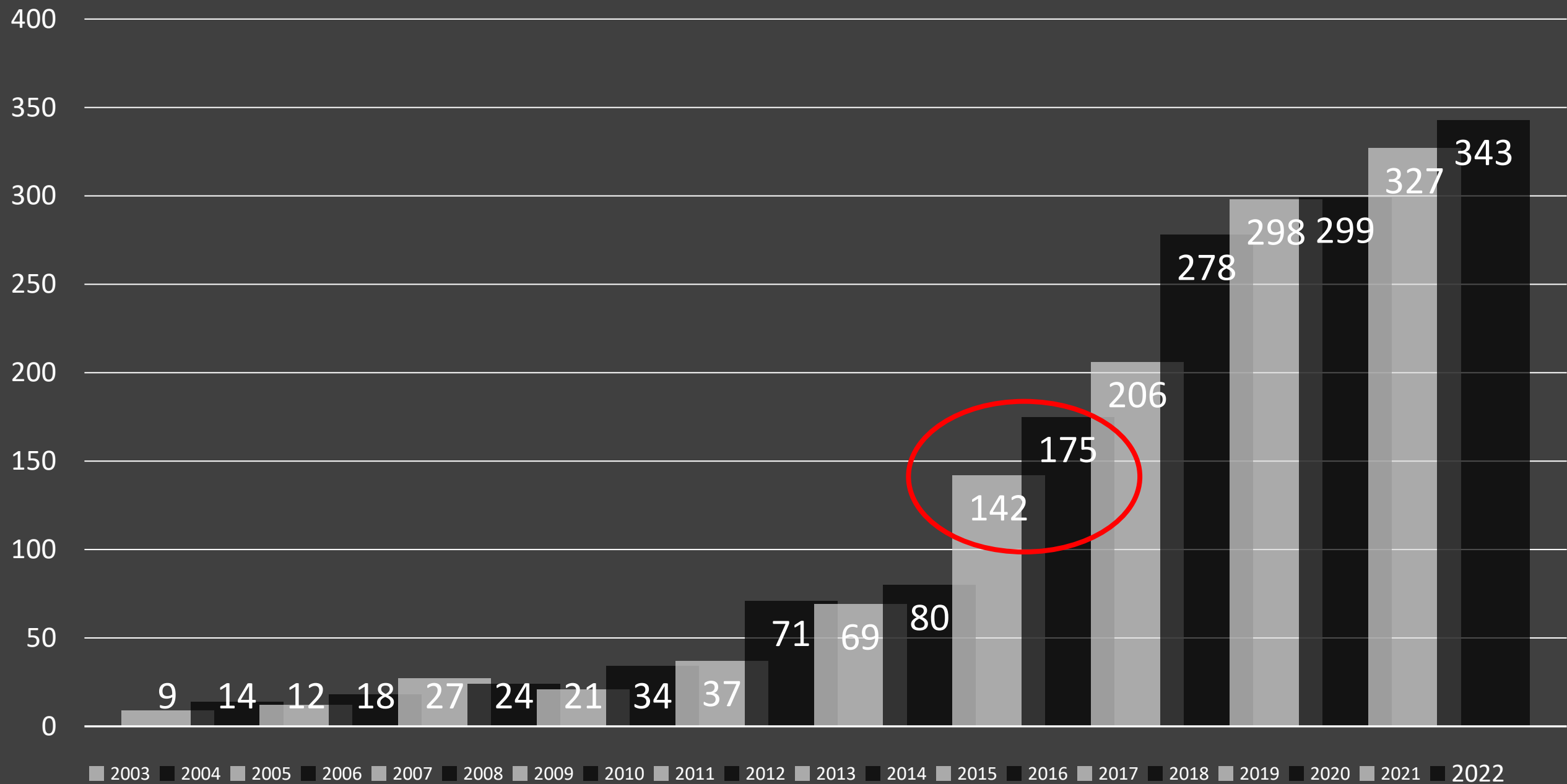
12.9%

Vs

26.9%

Symtomatiska
intrakraniella
blödningar
skiljer sig inte
emellan
grupperna

Antal trombektomier/år Sahlgrenska

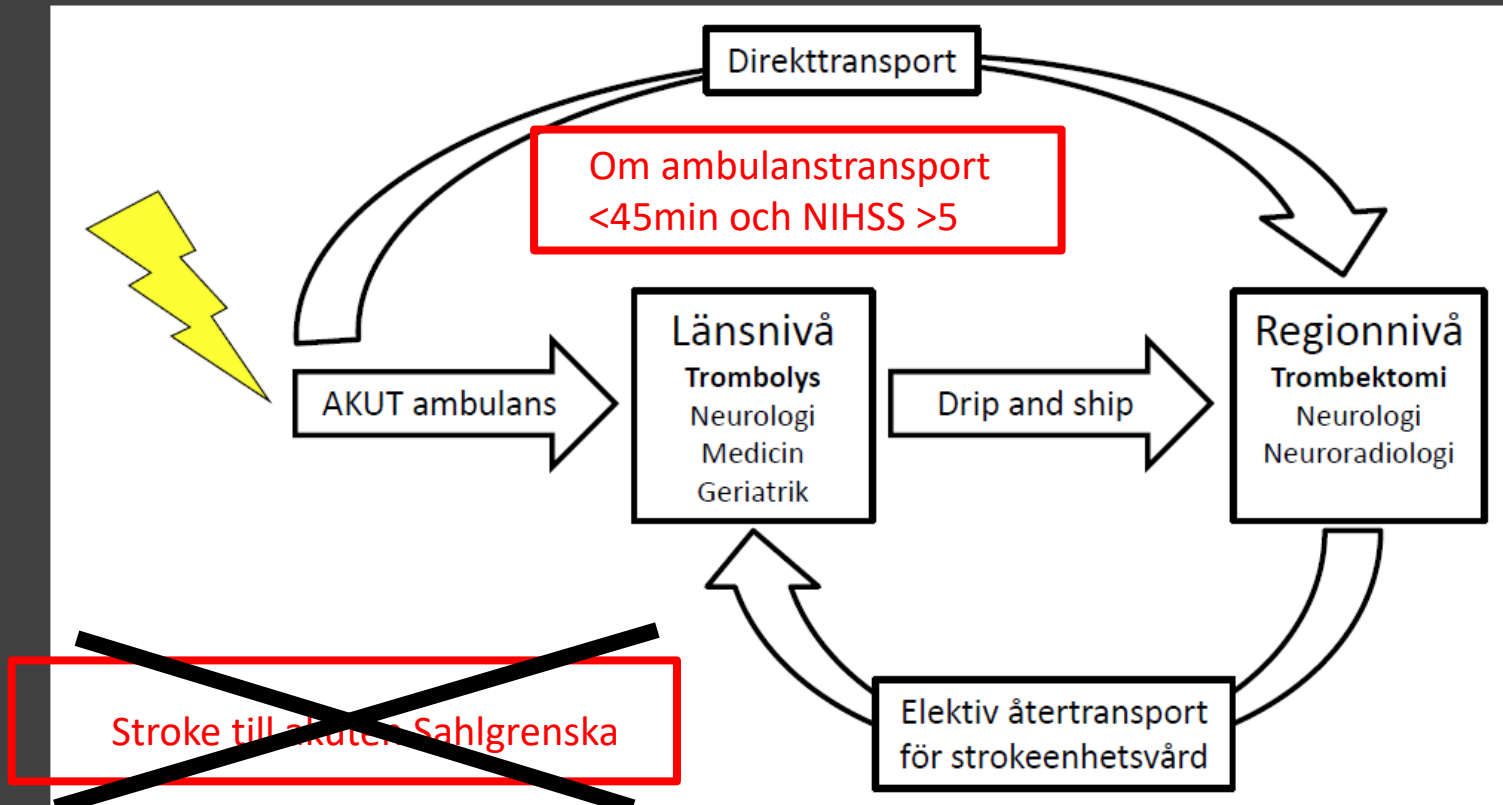


2016

Regional medicinsk riktlinje



Trombolys och trombektomi vid ischemisk stroke



2018
2020

Wake-up stroke/Stroke utan känd insjuknandetidpunkt

- DAWN
- DEFUSE-3
 - 388 pat
 - Trombektomi av ffa media 6-24 tim /6-16 tim inom senaste känd frisk
 - Antal oberoende 30% fler!!! (NNT ca 3)



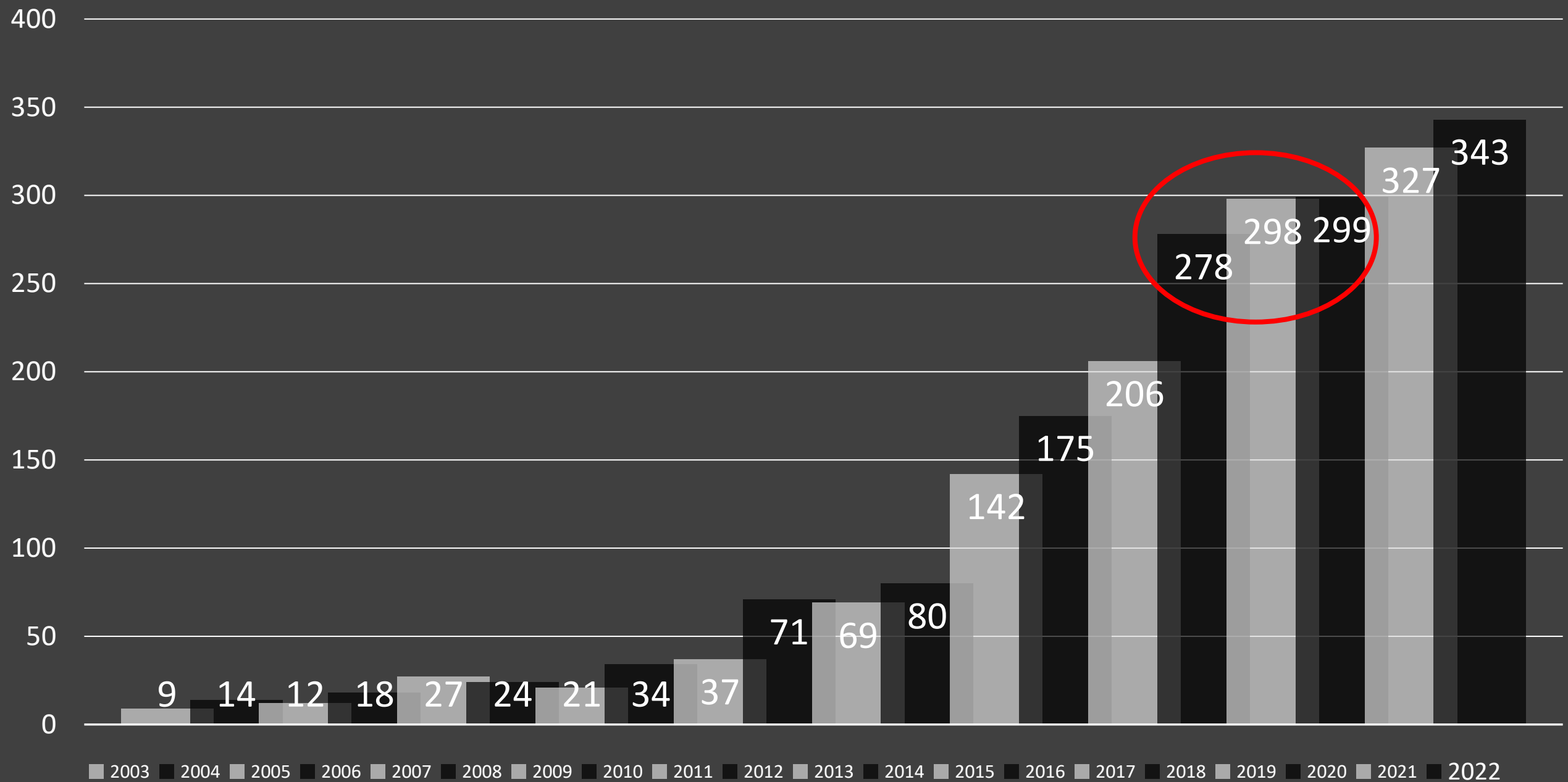
**Nationella riktlinjer
för vård vid stroke**

Sammanfattning av översyn 2020

Ordnat införande 2021-2022

Nogueira et al, NEJM, 2018
Albers et al, NEJM, 2018

Antal trombektomier/år Sahlgrenska

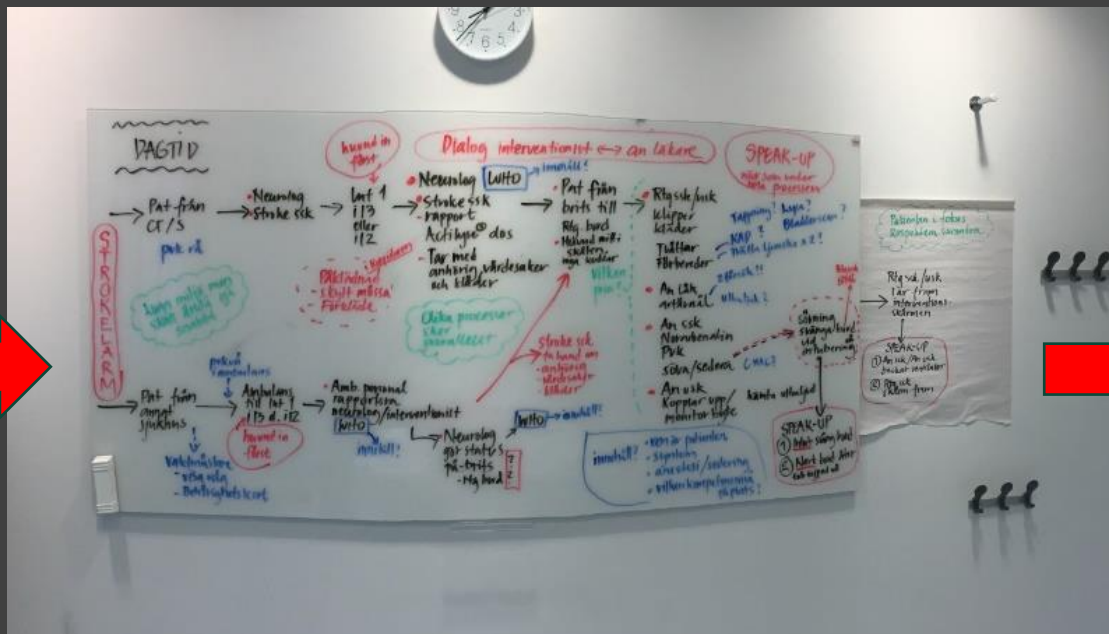


2018

Trombektomiprocessarbete



Team



Brainstorming



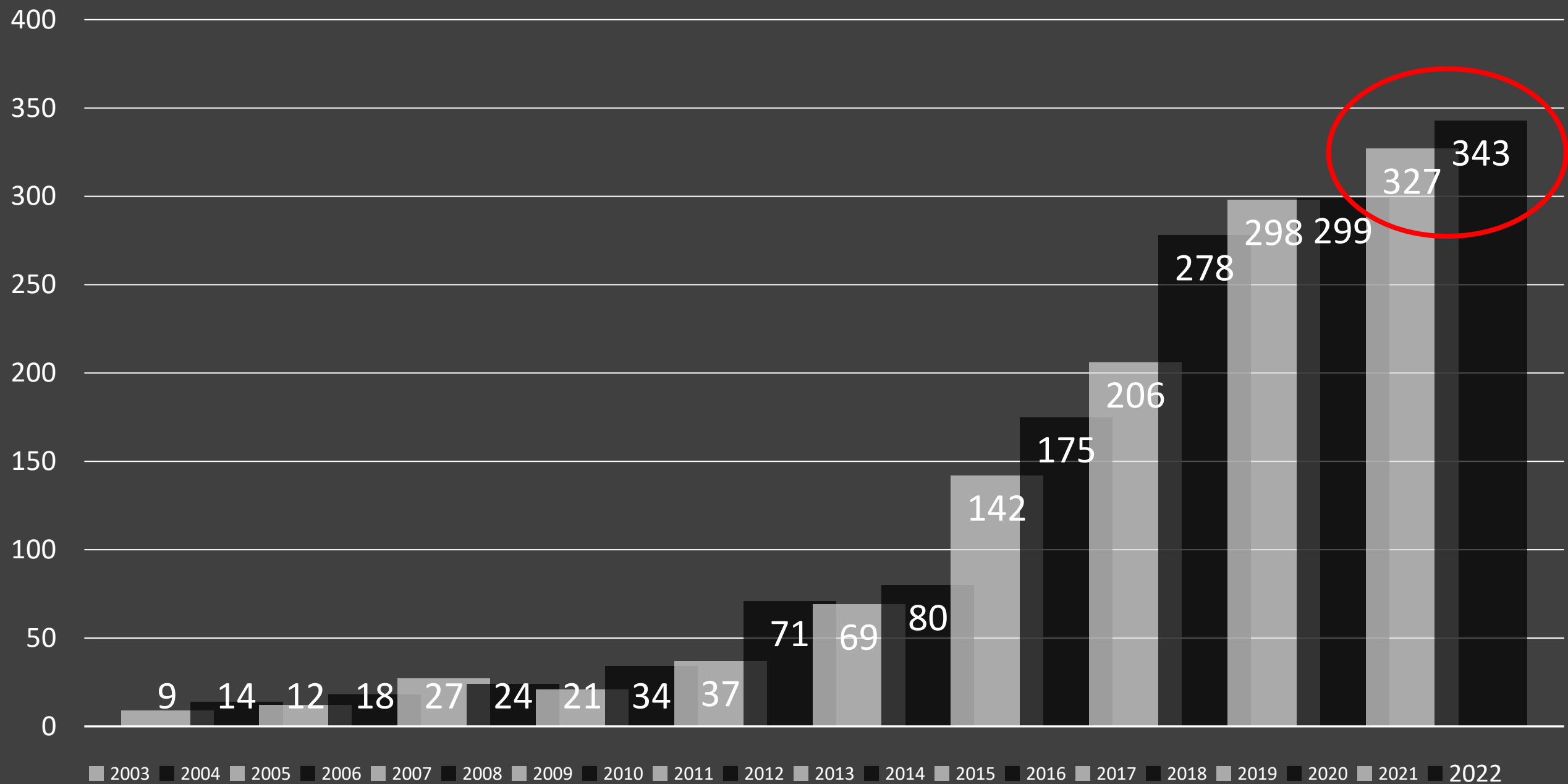
Simulerings-
övningar

Resultat trombektomiprocessarbete

- Door in Sahlgrenska–ljumskpunktion **28 min** (inklusive CT/CT-
angio perfusion +- trombolysis)
- Door-in Sahlgrenska – ljumskpunktion **11 min** (drip and ship)

Ankomst angio-lab på behandlande sjukhus – Kärlpunktion	Median, antal (totalt antal: 1 363)
Samtliga endovaskulära behandlingar 2022 (Totalt antal: 1363)	20 min (1339)
Norrlands Universitetssjukhus Umeå (Totalt antal: 98)	21 min (97)
Akademiska sjukhuset i Uppsala (Totalt antal: 122)	20 min (120)
Karolinska Universitetssjukhuset (Totalt antal: 304)	21 min (285)
Örebro Universitetssjukhus (Totalt antal: 175)	22 min (171)
Universitetssjukhuset i Linköping (Totalt antal: 81)	25 min (80)
Sahlgrenska Universitetssjukhuset (Totalt antal: 324)	11 min (321)
Skånes Universitetssjukhus i Lund (Totalt antal: 259)	20 min (259)

Antal trombektomier/år Sahlgrenska



Strokeutbildningsfilmen

- Multiprofessional stroke film som följer en patient från strokeinsjuknandet på jobbet – trombolys på det lokala sjukhuset – trombektomi
- Specialavsnitt med extra information

<https://larportalen.vgregion.se/course/view.php?id=3831>



2022

AI beslutsstöd trombeaktomi E-stroke Brainomix

App E-stroke Brainomix

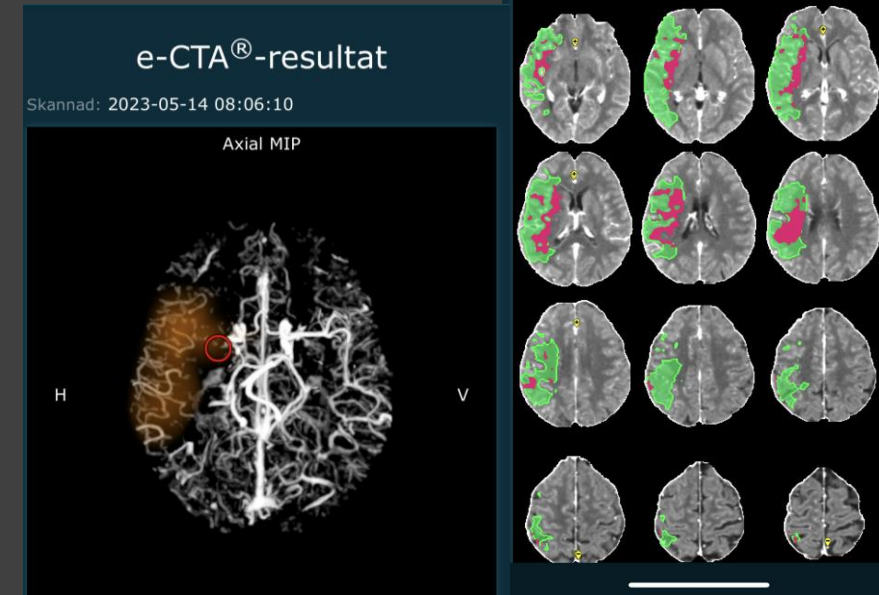


Kan ses av alla
som har
inloggning



Lokal bildgranskning vid
datortomograf eller
bildgranskning via
telemedicin

Bilder överförs parallellt till
lokal röntgenserver och till
E-stroke Brainomix



2022

AI beslutsstöd - E-stroke Brainomix

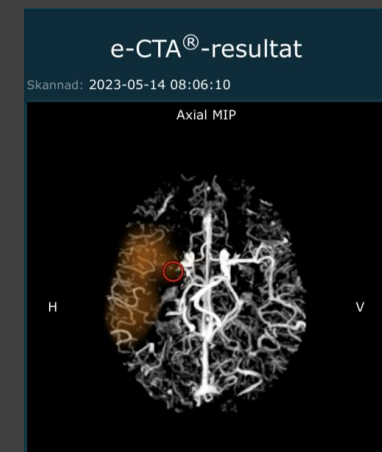
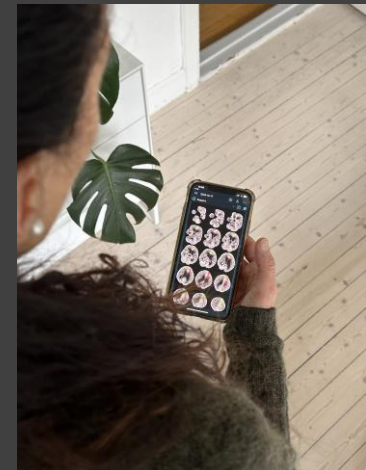
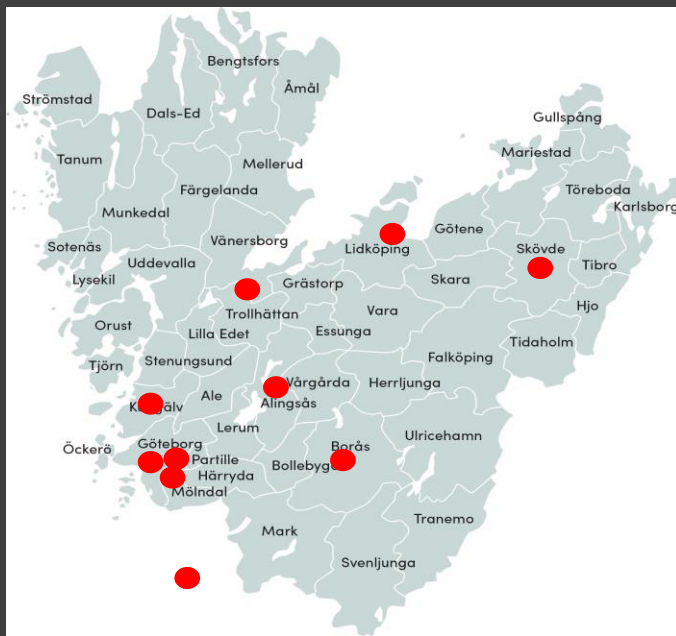
Automattolkning av
CT-perfusion på alla
sjukhus

Direkt åtkomst till
bilder vid samtal

Snabbt hitta
storkärlsocklusioner

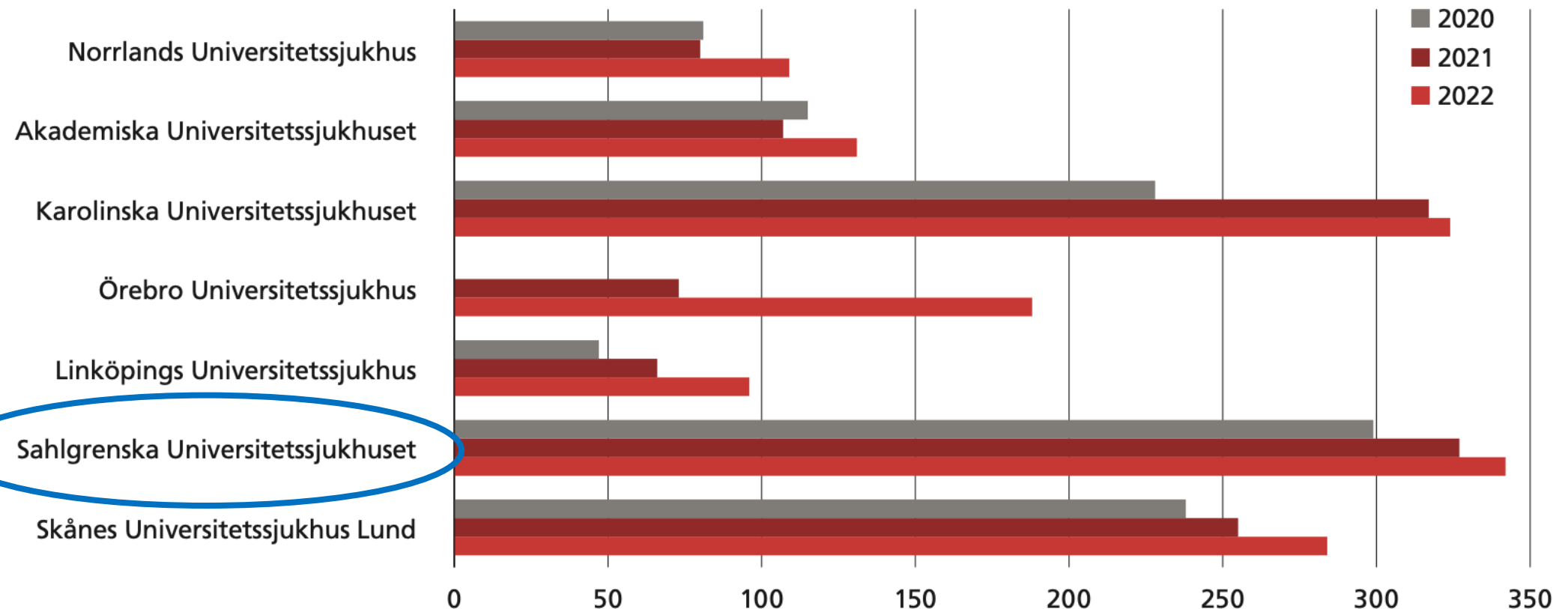
Snabba på tiden till
reperfusion även för
patienterna som
insjuknar långt från
trombektomicenter

AI-tolkning går
snabbt – enstaka
minuts fördröjning
jämfört med
bilderna på CT lab



Sahlgrenska University Hospital– EVTs per year

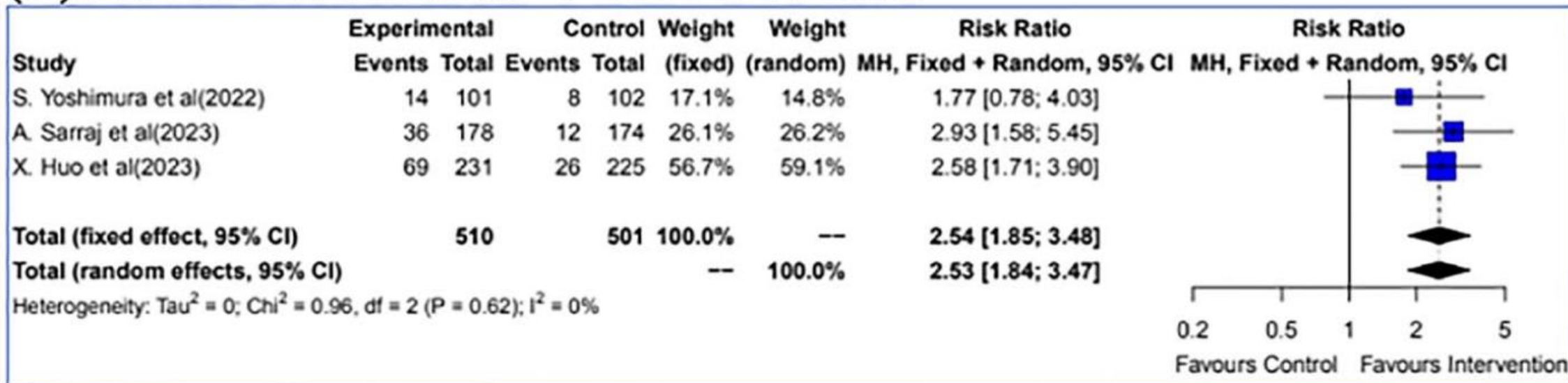
Figur 3: **Antalet registreringar av minst försök till endovaskulär behandling vid stroke under 2020 till 2022, redovisade på centernivå.**



2023

Trombektomi och stor infarktkärna?

(A) Forrest Plot of mRS-0-2 EVT vs MM



- 5 studier 2022-2023 stor infarktkärna < 24 tim
- NNT 7
- Ordnat införande?

Yoshimura et al N Eng J Med 2022
 Huo et al N Eng J Med 2022
 Sarraj et al N Eng J Med 2023
 Panigrahi et al 2023 Eur Stroke Journal

TACK!

- **Alexandros Rentzos** Öl Neuroradiologi/Neurointervention
- **Annika Nordanstig** sektionschef Neurologen
- **Lars Rosengren** Prof Öl Neurologen
- Christian Blomstrand sen Professor Neurologi
- **Karin Gullbrandsson** SSk, AnOPIVA o simulatorcentrum
- Martin Toresson SSk AnOpIVA
- Carina Sandin SSk Neurointervention
- Jan-Otto Andersson Verksamhetsutvecklare Ambulansen
- Sabina Hallin Isaksson Kommunikatör ambulansen
- Ebba Larsson Ssk Neurointervention
- Johan Dahlgren Ssk Ambulansen
- Amelia Nordahl Ssk Ambulansen
- Erik Ceder Öl Neuroradiologi/Neurointervention
- Jeanette Carlquist Öl Neuroradiologi/Neurointervention
- Åsa Lundin Ssk Neurologen
- Anna Molinder Specläk Neuroradiologi
- Synnöve Holseng Ssk Neurointerevention
- Ulf Bengtsson Usk Neurologen
- Patrik Martner Öl AnOpIVA
- Carl Hallgren Öl AnOpIVA
- Sigrid Latham avdchef radiologi
- Marit Johannesson Ssk Thoraxradiolog
- Dennis Duncker Neuroradiologi/Neurointervention
- Margareta Abrahamsson Öl Neurologen
- Mikael Jerndal Öl Neurologen
- OCH MÅNGA FLER, de flesta SU/Sahlgrenska....