# SEOHS
## 2024

# HET SYMPOSIUM DAT ÁLLE HEELKUNDIGE SPECIALISMEN VERBINDT

ANATOMIEGEBOUW, UTRECHT

1 november 2024

# RADICAAL

# SPONSOREN

## PLATINUM



## GOUD



## ZILVER



## BRONS



## OVERIG

**Collegium Chirurgicum Neerlandicum**

# INHOUD

# HISTORIE ANATOMIEGEBOUW
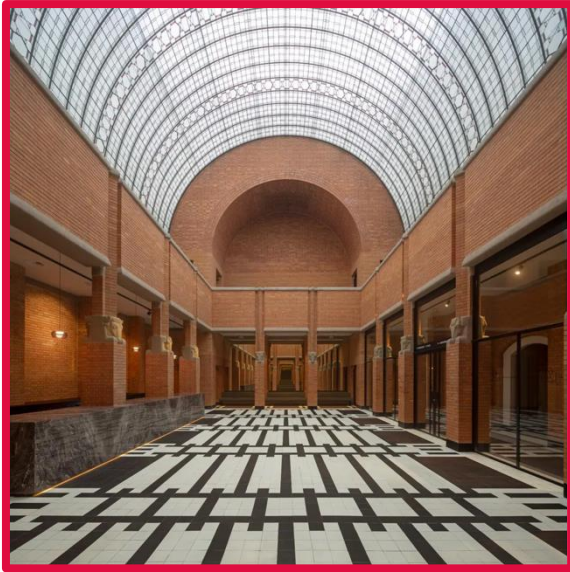


Het Anatomiegebouw is een bekend gebouw in de Utrechtse wijk Wittevrouwen, aan de Bekkerstraat. Het werd gebouwd in 1929 en diende oorspronkelijk als anatomisch laboratorium en collegezaal voor de faculteit Geneeskunde van de Universiteit Utrecht.

Zoals de naam al suggereert, werd het gebouw oorspronkelijk gebruikt voor het onderwijs in de anatomie. Studenten geneeskunde kregen hier colleges in het anatomisch theater en deden praktijkonderzoek in de snijzaal. In de kelder van het gebouw bevond zich ook een ruimte voor het opbaren en prepareren van lichamen ten behoeve van onderwijs en onderzoek.



De keuze voor het Anatomiegebouw als locatie voor een symposium dat alle heelkundige specialismen bij elkaar breng, is bijzonder passend. Dit iconische gebouw vormt een verbinding tussen het rijke verleden van medisch onderwijs en de huidige vooruitgang in de chirurgie.
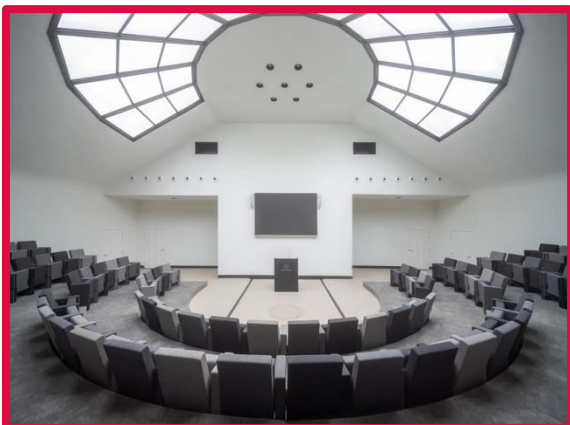
# VOORWOORD PRESIDENT SEOHS 2024

Welkom op het jaarlijkse Symposium Experimenteel Onderzoek Heelkundige Specialismen (SEOHS). Wij zijn blij dat wij u vandaag mogen ontvangen voor een ongetwijfeld boeiende en inspirerende dag in Utrecht.

Het thema van dit jaar is 'Radicaal', een woord dat op vele manieren kan worden geïnterpreteerd. Radicaal betekent het lef om baanbrekende beslissingen te nemen, om met experimentele technieken en complexe uitdagingen aan te gaan en om de grenzen van wat mogelijk is voortdurend te verleggen. Binnen de snijdende specialismen zijn wij, meer dan ooit, op zoek naar methoden die niet alleen effectief zijn, maar ook bijdragen aan de verbetering van de kwaliteit van leven van onze patiënten. Laten we samen onderzoeken hoe radicaal denken kan leiden tot een betere en duurzamere toekomst voor ons specialisme. Deze thema's zullen vandaag aan bod komen in de wetenschappellijke voordrachten en lezingen van onze keynote sprekers.

Ik nodig u allen uit om vandaag niet alleen te luisteren, maar ook actief deel te nemen aan de discussies, uw ervaringen te delen vanuit uw eigen specialisme en vooral van elkaar te leren. Want we groeien het snelst wanneer we onze kennis delen en openstaan voor nieuwe inzichten.

Nogmaals van harte welkom!

Namens de commissie SEOHS '24,
Isabel Brüggenwirth

# OVERZICHT SEOHS 2024

| TIJD | WAT | WAAR |
|---|---|---|
| 08:30 – 09:00 | Inloop | Centrale hal |
| 09:00 – 09:05 | Opening symposium | Anatomisch theater |
| 09:05 – 10:15 | Abstract sessie 1 (Radicale Diagnostiek) | Anatomisch theater |
| 10:15 – 10:45 | Pauze | |
| 10:45 – 12:20 | Abstract sessie 2 (Radicale Therapie) | Anatomisch theater |
| 12:20 – 13:30 | Lunchpauze Sponsormarkt en workshop | Centrale hal Snijzaal |
| 13:30 – 14:50 | Abstract sessie 3 (Radicale Therapie) | Anatomisch theater |
| 14:50 – 15:15 | Pauze | |
| 15:15 – 15:45 | Prijsuitreiking | Anatomisch theater |
| 15:50 – 17:00 | Borrel | Centrale hal |
| 17:00 – 23:00 | Voortzetting borrel | Villa Orloff |

# KEYNOTE SPREKERS

Cees-Rein van den Hoogenband studeerde Geneeskunde in Utrecht en specialiseerde zich in de chirurgie. Hij promoveerde in inversie trauma van de enkel. Hij was werkzaam als chirurg in het St. Anna Ziekenhuis. Daarnaast was hij 25 jaar clubarts van PSV, en begeleidde topspelers als Ruud van Nistelrooij. Tevens was hij teamarts van de Nederlandse Zwemploeg tijdens de Olympische Spelen. In 2012 en 2016 was Cees-Rein chef arts voor het NOC*NSF tijdens de Olympische Spelen. Reeds in hij voorzitter van de medische commissie van de FINA, de overkoepelende internationale zwembond.

Laura Jackish is een biochemicus en hoofd van de Fat Tissue Engineering-afdeling bij Mosa Meat, een bedrijf dat kweekvlees ontwikkelt. Ze specialiseert zich in het creëren van vetweefsel, essentieel voor de smaak en textuur van labvlees. Jackisch behaalde haar PhD in in Warwick. Sinds haar overstap naar Mosa Meat heeft ze een leidende rol gespeeld in het onderzoek naar gekweekt vetweefsel, een cruciale component van kweekvlees. Haar werk draagt bij aan een toekomst waarin voedselproductie duurzamer en ethischer wordt.

Frank van de Goot is een van de bekendste forensisch pathologen in Nederland, gespecialiseerd in het onderzoeken van doodsoorzaken. Van de Groot richtte zijn eigen Centrum voor Forensische Pathologie op na zijn vertrek bij het Nederlands Forensisch Instituut in 2010. Hij staat bekend om zijn kritische benadering en contra-expertises in complexe zaken. Zijn werk speelt een belangrijke rol in het bieden van antwoorden aan nabestaanden, zoals blijkt uit zijn programma Doden Liegen Niet, waarin hij helpt onduidelijkheden over doodsoorzaken op te helderen.

# PRIJSUITREIKING

## SEOHS 2023 - REISSTIPENDIUM



Jens te Velde heeft het reisstipendium gewonnen met zijn studie naar compressiefracturen van de wervelkolom na conventionele uitwendige bestralingstherapie.

## SEOHS 2023 – PROF. DR. KLOPPERPRIJS



Myrthe Eussen heeft de prof. dr. Klopperprijs gewonnen met haar studie waarin ze de milieuvoordelen, kosten, prestaties en verontreinigingsrisico's van chirurgische instrumentaria heeft vergeleken. Deze studie benadrukt de milieuvoordelen van herbruikbare en recyclebare wegwerpinstrumenten.

# AGENDA SEOHS 2024

| | | |
|---|---|---|
| 09:00 – 09:05 | **Welkom** | |
| | *Isabel Brüggenwirth* | |

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**SESSIE 1**      **RADICALE DIAGNOSTIEK**

</div>

Moderators: *dr. Schlösser, prof. dr. Coert*

| | |
|---|---|
| 09:05 – 09:13 | **The functional inflammatory program of circulating neutrophils after severe traumatic injury** |
| | *Loulou Duebel* |
| 09:13 – 09:21 | **Quantitative fluorescence imaging with Indocyanine green to prevent anastomotic leakage during gastric conduit surgery** |
| | *Stefan Koning* |
| 09:21 – 09:29 | **Predictive Factors for a Positive Tinel Sign in Patients with Diabetic Neuropathy** |
| | *Anne Merijn Eligh* |
| 09:29 – 09:37 | **Assessing diagnostic accuracy: 18F-FDG PET-CT Scans in Low-Grade Infection Detection among Post-traumatic Long Bone Non-unions** |
| | *Lotte van der Broeck* |
| 09:37 – 09:45 | **Beyond single-use: a systematic review of environmental, economic, and clinical impacts of endoscopic surgical instrumentation** |
| | *Myrthe Eussen* |
| 09:45 – 10:15 | **Zwemsportperikelen tijdens de Olympische Spelen 2024** |
| | *Cees-Rein van den Hoogenband* |
| 10:15 – 10:45 | PAUZE |

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**SESSIE 2**      **RADICALE THERAPIE**

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Moderators: *dr. Groot, dr. van Dongen*

| | |
|---|---|
| 10:45 – 10:53 | **Surgery for perihilar cholangiocarcinoma without preoperative biliary drainage: A retrospective multicentre propensity scores weighted analysis** |
| | *Julien Luyten* |
| 10:53 – 11:01 | **ACT-guided Heparinization Versus a Standardized Bolus of Unfractionated Heparin in Open Abdominal Aortic Aneurysm Repair** |
| | *Thomas Steunenberg* |
| 11:01 – 11:09 | **Management of esophageal cancer with concurrent cervical node metastasis: a nationwide population-based cohort study** |
| | *Maxime Sanders* |

| 11:09 – 11:17 | **Chemical Hip Denervation using Phenol via Pericapsular Nerve Group (PENG) Block in Non-Operative Management for Frail Older Hip Fracture Patients: A Multicenter Retrospective Cohort Study**<br>*Thamar Kroes* |
|---|---|
| 11:17 – 11:47 | **Mosa Meat – 'Beef' burgers of the future**<br>*Laura Jackish* |
| 11:47 – 11:55 | **Surgical outcomes and prognosis of HER2+ invasive breast cancer patients with a DCIS component treated with breast-conserving surgery after neoadjuvant systemic therapy** *Roxanne*<br>*Roxanne Ploumen* |
| 11:55 – 12:03 | **Short-term Host Response on Electrospun P4HB Scaffold in Sheep**<br>*Krista van Rest* |
| 12:03 – 12:11 | **Functional assessment of the future liver remnant: a retrospective case study comparing portal vein embolization vs radiation lobectomy**<br>*Rosalie van Rees* |
| 12:11 – 12:19 | **Finding the optimal treatment for neuroma pain**<br>*Catherine van den Berg* |
| 12:19 – 13:30 | LUNCH & WORKSHOP/SPONSORMARKT |

| **SESSIE 3** | **RADICALE DIAGNOSTIEK** |
|---|---|
| | Moderators: *dr. Go, dr. Nijdam* |
| 13:30 – 14:10 | **Forensische pathologie**<br>*Frank van de Goot* |
| 14:10 – 14:18 | **The reliability of the Lane-Sandhu score and the modified RUST for assessment of postoperative radiographs of long bone non-unions and bone defects**<br>*Laureanne Lodewijks* |
| 14:18 – 14:26 | **Fracture rate after conventional external beam radiation therapy to the spine in multiple myeloma patients**<br>*Jens te Velde* |
| 14:26 – 14:34 | **Activation of the systemic innate immune response indicates more tissue damage during pancreaticoduodenectomy compared to CABG; a pilot study**<br>*Emma de Fraiture* |
| 14:34 – 14:42 | **Intraoperative margin assessment in oral cancer using fluorescence guided surgery and fresh frozen sectioning**<br>*Bas Keizers* |

| 14:42 – 14:50 | **The Safety and Accuracy of Radiation-Free Spinal Navigation Using an Ultrashort, Scoliosis-Specific BoneMRI-protocol Compared to CT**<br>*Peter Lafranca* |
|---|---|
| 14:50 – 14:58 | **Review on Diagnostic and Treatment Delay of Giant Cell Tumor of Bone**<br>*Mylène Duivenvoorden* |
| 15:06 – 15:14 | **Hospital Volume and Real-World Outcomes After Surgical Myectomy in a Nationwide Study**<br>*Tijn Heeringa* |
| 15:14 – 15:30 | PAUZE |

<div style="background-color:#E2001A; color:white; font-weight:bold; padding:4px 12px;">PRIJSUITREIKING</div>

| 15:30 – 15:48 | **Voordracht winnaars SEOHS 2023**<br>*Jens te Velde* en *Myrthe Eussen* |
|---|---|
| 15:48 – 15:55 | Prijsuitreiking 2024 |
| 15:55 – 16:00 | Afsluiting |

# WORKSHOPS

Tijdens de lunchpauze is er in de snijzaal een workshop van de industrie.

## BAXTER – ACTIVE HEMOSTASIS

Tijdens deze workshop laat Baxter middelen zien die gericht zijn op het bevorderen van hemostase. Tijdens een demonstratie worden deze middelen in verschillende klinische scenario's getoond, waarbij hun werking en voordelen in het beheersen van bloedingen worden uitgelegd.

# ABSTRACTS SEOHS 2024

## 1. The functional inflammatory program of circulating neutrophils after severe traumatic injury
*Loulou Duebel*

**Background:** Severe traumatic injury is often accompanied by late-onset infectious complications, which may originate from a malfunctioning immune response involving the neutrophil compartment. Severe trauma triggers the release of different neutrophil subsets into the circulation, characterized by CD16 and CD62L surface expression. The phenotype, function, and role of these neutrophil subsets are poorly defined but are hypothesized to be significant to post-traumatic prognosis and the onset of infectious complications.

**Objective:** To explore the (antibacterial) function of circulating neutrophils during the first two weeks after severe trauma, in relation to the development of infectious complications.

**Methods:** A small prospective observational cohort study was designed to sample blood from severely injured patients within the first 15 days after trauma. Blood neutrophil counts, surface marker expression, phagocytosis, phagolysosomal acidification, and bacterial killing capacity were analyzed over time and compared to control values.

**Results:** 15 male patients were included, with 7 patients developing at least one infectious complication, which had a median onset of 7 days after injury. Banded neutrophils were observed during the initial leukocytosis immediately after trauma, while progenitors and hypersegmented neutrophils appeared during the second leukocytosis several days after trauma. Phagocytosis capacity was increased compared to controls at all time points, while acidification was decreased. Significant variations in killing capacity were found between the different neutrophil subsets. The infectious group showed a trend of decreased killing capacity in the whole neutrophil population, already present in the first days after trauma, whereas the non-infectious group did not.

**Conclusions:** This study reveals abnormalities in the circulating neutrophil compartment that emerge within the first hours and persist throughout the first 15 days after severe trauma. These abnormalities were associated with both the number and functional variability (phagocytosis, acidification, and bacterial killing) of different neutrophil subsets. These findings support the theory of unbalanced innate immune responses caused by the massive release of DAMPs from damaged tissues in trauma patients.

Table 3 ICG NIR fluorescence imaging outcome

| Perfusion parameter* | ROI proximal | | | ROI distal | | | ROI anastomosis | | | Δ ROI proximal – ROI anastomosis | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Anastomotic leakage | No leakage | P** | Anastomotic leakage | No leakage | P** | Anastomotic leakage | No leakage | P** | Anastomotic leakage p*** | No leakage p*** |
| Imax | 129.4 [72.7;166.5] | 130.3 [108.7;168.3] | 0.48 | 32.4 [16.9;47.3] | 44.5 [35.9;66.9] | 0.03 | 68.4 [40.5;103.1] | 86.4 [68.6;107.9] | 0.15 | <0.001 | <0.001 |
| Tmax | 17.0 [14.0;21.8] | 15.0 [12.8;18.3] | 0.13 | 131.0 [65.8;155.8] | 141.5 [87.5;153.0] | 0.87 | 51.5 [30.0;144.8] | 41.5 [20.3;71.8] | 0.14 | <0.001 | <0.001 |
| Ingress Rate | 6.5 [4.6;9.8] | 7.7 [5.9;10.8] | 0.23 | 0.3 [0.1;0.4] | 0.3 [0.3;0.7] | 0.43 | 1.0 [0.3;3.3] | 2.0 [0.9;3.8] | 0.08 | <0.001 | <0.001 |
| Slope | 11.7 [7.3;16.5] | 13.4 [10.2;18.3] | 0.20 | 1.2 [0.9;2.2] | 1.7 [1.2;2.8] | 0.09 | 4.8 [3.9;8.5] | 6.0 [4.1;8.9] | 0.09 | <0.001 | <0.001 |
| Slope Norm | 9.8 [8.3;11.9] | 10.2 [8.9;12.2] | 0.42 | 4.1 [3.0;6.8] | 4.1 [2.6;5.3] | 0.36 | 7.0 [4.3;8.7] | 7.4 [5.7;9.1] | 0.20 | <0.001 | <0.001 |
| AUC30 | 79.6 [73.3;89.0] | 79.0 [75.1;85.1] | 0.72 | 95.3 [85.7;98.1] | 97.6 [95.7;98.4] | 0.30 | 96.5 [94.4;98.5] | 95.8 [89.9;97.3] | 0.29 | 0.001 | <0.001 |
| AUC60 | 71.3 [66.3;76.1] | 69.9 [66.6;76.8] | 0.66 | 86.4 [62.1;94.6] | 95.9 [89.5;97.7] | 0.06 | 93.8 [89.6;97.0] | 92.7 [84.2;96.0] | 0.28 | 0.002 | <0.001 |
| AUC120 | 66.0 [58.9;76.1] | 63.8 [61.0;69.6] | 0.38 | 61.8 [53.2;-] | 77.9 [51.6;-] | 0.83 | 87.9 [79.2;94.6] | 81.2 [72.7;87.4] | 0.14 | 0.012 | <0.001 |

*Variables are denoted as median [inter quartile range]. **Intra-ROI differences were tested with the Mann-Whitney U test. ROI = region of interest. ***Inter ROI differences were tested with the Wilcoxon Signed Rank test. Imax= maximum fluorescence intensity. Tmax = time to maximum fluorescence intensity. Ingress Rate = mean slope of the inflow. AUC = area under the curve.

## 2. Quantitative fluorescence imaging with Indocyanine green to prevent anastomotic leakage during gastric conduit surgery
*Stefan Koning*

**Background:** In 2023, 2.714 new cases of oesophageal cancer were diagnosed in the Netherlands, characterized by a 5-years survival rate of only 24%. A gastric conduit reconstruction is a standard procedure following oesophageal resection but is associated with a high risk of severe complications, particularly anastomotic leakage(AL) which occurs in approximately 20% of all patients.

Inadequate perfusion of the gastric conduit is a significant contributing factor to the development of AL. Quantitative near-infrared fluorescence imaging with indocyanine green (ICG NIRF) is a validated objective technique for assessing tissue perfusion. This study aims to evaluate the potential of quantitative ICG NIRF imaging as a diagnostic tool to prevent AL in gastric conduit surgery.

**Methods:** 78 patients undergoing oesophagectomy with gastric conduit reconstruction were included in this multicentre study. Intraoperatively, a standardized protocol was used to record NIRF imaging videos of the gastric conduit. Intra-operative anastomosis positioning was based on the subjective interpretation of the ICG signal. Postoperatively, the videos were quantified to extract time-intensity curves including perfusion parameters on three regions of interest (site of anastomosis, distal control, proximal control). The correlation between perfusion parameters, anastomotic leakage and other clinical outcomes were analysed.

**Results:** Near significance was found in 5 out of 8 perfusion parameters (p=0.08, 0.09, 0.14, 0.14 & 0.15) proving a decrease in blood flow throughout the gastric conduit when an AL occurs. Significant differences were observed between all parameters of the distal and proximal control ROIs.

**Conclusion:** The initial findings from the first 78 patients show promising results in predicting anastomotic leakage using NIR fluorescence. NIRF imaging has the potential to predict inadequate perfusion.

## 3. Predictive Factors for a Positive Tinel Sign in Patients with Diabetic Neuropathy

*Anne Merijn Eligh*

**Background:** Diabetes Mellitus (DM) is a global health concern affecting hundreds of millions individuals worldwide. As DM progresses, the risk of complications including diabetic sensorimotor polyneuropathy (DSP), diabetic foot ulcer (DFU), amputation and mortality rises. Compression neuropathy is an underestimated problem in these patients. There is a need to identify predictors for a positive Tinel sign in diabetic patients, aiming for early detection and management.

**Methods:** This multicenter cross-sectional study enrolled 996 type 1 and 2 diabetic patients, as part of the baseline screening for the DeCompression (DECO) study. Thorough assessments, including the Michigan Neuropathy Screening Instrument (MNSI) questionnaire and the Tinel test at the tarsal tunnel, were employed to evaluate neuropathic symptoms and compression neuropathy in all individuals. Statistical analyses with logistic regression were conducted to identify predictors for nerve entrapment of the posterior tibial nerve.

**Results:** The study reveals a significant prevalence of tibial nerve entrapment (58.4%) in diabetic patients. Those with a positive Tinel sign exhibited higher neuropathic complaints, further validating the Tinel sign as a diagnostic tool for nerve entrapment. Key predictors for tibial nerve compression included numbness, hypersensitivity, prickling sensations, impaired sensation while walking, exacerbation at night, diabetic neuropathy diagnosis, younger age, and a history of compression neuropathy.

**Conclusion:** This study underscores the importance of a multifactorial diagnostic approach, integrating specific MNSI questions, medical history, and age considerations. Identifying predictors for tibial nerve entrapment holds implications for early intervention, reducing the risks of

DFUs, amputations, and mortality in a growing global diabetic population.

## 4. Assessing diagnostic accuracy: 18F-FDG PET-CT Scans in Low-Grade Infection Detection among Post-traumatic Long Bone Non-unions
*Lotte van der Broeck*

**Introduction:** The diagnosis of low-grade infection in post-traumatic long bone non-unions poses challenges due to the absence of clinical signs. This study aimed to assess the diagnostic accuracy of 18F-FDG PET-CT scans for low-grade infection in post-traumatic long bone non-unions.
**Methods:** A retrospective study was conducted including adult patients with a long bone non-union, suspected of infection. All patients underwent 18F-FDG PET-CT scans as the index test before surgical intervention, with peri-operative cultures obtained during surgery serving as the reference standard. Semiquantitative analyses were performed on the standardized uptake value (SUV) measurements obtained from the PET-CT scans. Diagnostic accuracy measures including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated. Receiver operating characteristic (ROC) curve analysis was employed to evaluate the discriminatory ability of SUV measurements.
**Results:** The study included a total of 51 18F-FDG PET-CT scans and cultures from 50 patients with long bone non-unions. The diagnostic accuracy was found to be 0.67 (95% CI 0.44 - 0.87). The PPV and NPV were calculated as 0.79 (95% CI 0.53 - 1.00) and 0.52(95% CI 0.30 - 0.73), respectively Semiquantitative analyses of SUV measurements demonstrated a low level of accuracy, with all area under the curve (AUC) values < 0.75 and ROC curves showing a trajectory fairly parallel to the diagonal line.

**Conclusion and Discussion:** The findings of this study indicate that in posttraumatic long bone non-unions, where a low-grade fracture-related infection (FRI) is suspected, the 18F-FDG PET-CT has a performance that is advantageous over other imaging techniques. A careful interpretation of the scan results is warranted, possibly including the semiquantitative analysis on tracer uptake as an adjunct. Nevertheless, the diagnostic accuracy in this condition is not as good as in early-onset FRI cases, and this should be taken into account when treating these challenging cases.

## 5. Beyond single-use: a systematic review of environmental, economic, and clinical impacts of endoscopic surgical instrumentation
*Myrthe Eussen*

**Background:** The evolution of endoscopic surgery has introduced a multitude of instruments, available in both disposable and reusable variants, influencing practices across various surgical specialties. Instrument selection is complex, considering individual preferences and institutional factors such as costs, instrument performance, and factors related to cleaning and sterilization. Notably, environmental sustainability has gained prominence due to the threat of climate change. This review assessed the existing literature to facilitate evidence-informed decision-making, encompassing clinical and economic efficacy, environmental friendliness, and other important criteria.
**Materials and Methods:** Following PRISMA guidelines, searches were conducted in Pubmed, Embase, Web of Science, and The Cochrane Library for studies comparing the environmental impact, costs, instrument performance, and contamination risk of disposable versus reusable instruments or new versus

reprocessed disposables in endoscopic surgery. Life-Cycle Assessments (LCAs) were included to quantify the climate impact. Exclusions included veterinary studies, general endoscopic procedures, and novel instruments.

**Conclusion:** The search yielded 15,809 studies, 53 studies meeting the inclusion criteria: 38 compared disposable versus reusable instruments and 15 examined new versus reprocessed disposables. Reusables and/or reprocessed disposables showed favorable environmental and economic outcomes compared to new disposables. Instrument performance was comparable between the two groups. No studies were identified that investigated the clinical implications of contamination risk of disposables versus reusables. Six studies evaluating contamination risk of reusables and reprocessed disposables showed residual pollution after cleaning and sterilization, although data on clinical outcome lacked.

**Interpretation:** This review underscores the environmental benefits of reusables and favors both reusable and reprocessed disposables for their economic advantages. The lack of clear evidence favoring one type over the other in instrument performance necessitates further research. Addressing contamination risks requires additional studies on the clinical impact of residual substances. Future research should report outcomes on environmental sustainability, costs, instrument performance, and contamination risk.

## 6. Surgery for perihilar cholangiocarcinoma without preoperative biliary drainage: A retrospective multicentre propensity scores weighted analysis

*Julien Luyten*

**Background:** There is no consensus on the use of preoperative biliary drainage (PBD) for resectable perihilar cholangiocarcinoma (pCCA). This retrospective cohort study aims to determine the effect of PBD on postoperative mortality and morbidity in pCCA patients.

**Methods:** Patients with histologically confirmed pCCA who underwent major hemihepatectomy in 27 Western hepato-biliary centres between 2000 and 2022, were identified from the pCCA Collaboration Group database. To correct for confounding variables, we performed propensity score weighting (PSW) using a generalised linear model. A propensity score weighted regression (PSWR) was used to compare outcomes between undrained and drained patients.

**Results:** Overall, 2067 patients were included of whom 350 (16.93%) patients did not undergo PBD. Before applying PSW, significant differences in disease stage and clinical course were observed, with drained patients presenting in more advanced stages. After PSW, no statistical differences were found between the two groups. Regarding outcomes after PSWR, 90-day mortality (OR: 1.45, 95% CI: 0.77-2.74, p=0.15) was unaffected by PBD. Similarly, no difference was observed in major postoperative complications (p=0.48), postoperative bleeding (p=0.07) or bile leak (p=0.13). However, postoperatively drained patients exhibited a higher likelihood of liver failure (OR: 2.19, 95% CI: 1.19-4.07, p=0.006).

**Conclusion**: In patients with resectable pCCA, preoperative PBD did not affect 90-day mortality. However, patients who underwent PBD had a higher likelihood of post-hepatectomy liver failure. This analysis highlights the potential benefit of not draining patients unless strictly.

## 7. ACT-guided Heparinization Versus a Standardized Bolus of Unfractionated Heparin in Open Abdominal Aortic Aneurysm Repair

*Thomas Steunenberg*

**Background:** Thrombo-embolic complications are common after open abdominal aortic aneurysm (AAA) repair. The optimal dosage of intraoperative unfractionated heparin and the role of monitoring the activated clotting time (ACT) are unknown.

**Methods:** A international multicenter randomized controlled trial was conducted in patients undergoing open AAA comparing ACT-guided heparinization with a dose of 100 IU/kg heparin and a target time of 200 seconds with a standardized bolus of 5000 IU heparin as control group. Primary outcome was a combined incidence of thrombo-embolic complications and 30-day mortality.

**Results:** The trial was ended prematurely due to futility, involving a total of 294 patients. The primary outcome occurred in 34 patients (23%) in the ACT-group versus 37 patients (26%) in the 5000 IU group (absolute difference -2.7%; 95% confidence interval [CI], -12.5 to 7.1). Bleeding complications occurred in 63 patients (42%) in the activated clotting time group versus 48 patients (33%) in the 5000 IU group (absolute difference 9.2%; 95% CI, -1.8 to 20.2). Mortality was higher in the activated clotting time group (11% versus 3%; absolute difference 8%; 95% CI, 2.3 to 13.6). No difference was found in the incidence of thrombo-embolic complications (20% versus 26%; absolute difference -5.4%; 95% CI, -15 to 4.2).

**Conclusions:** In patients undergoing open abdominal aortic aneurysm repair, heparinization with 100 IU/kg and activated clotting time monitoring with target of 200 seconds did not reduce the incidence of thrombo-embolic complications and was associated with an increased risk of mortality compared to a standardized bolus of 5000 IU of heparin.

## 8. Management of esophageal cancer with concurrent cervical node metastasis: a nationwide population-based cohort study

*Maxime Sanders*

**Background:** In the Netherlands there is a small subset of esophageal cancer patients that present with concurrent cervical lymph node metastasis (LNM). Historically this was seen as distant metastasis and surgical intervention has usually not been an option for these patients.

**Methods:** This population-based cohort study utilized data from the Netherlands Cancer Registry (NCR), encompassing patients with locally advanced thoracic esophageal cancer and concurrent cervical LNM. Treatment modalities were categorized into five groups: neoadjuvant therapy followed by surgery(Neo+S), definitive chemoradiotherapy(dCRT), chemotherapy with or without radiotherapy <30Gy(CT), radiotherapy(RT), and best supportive care(BSC). Overall survival(OS) was assessed using the Kaplan-Meier method and compared via the log-rank test. Hazard rates were computed using Cox proportional hazards regression, with adjustment for confounding achieved through inverse probability of treatment weighting (IPTW).

**Results:** Between 2015 and 2021, a cohort of 412 patients was identified. Median survival durations were observed as follows: 24.2 months for Neo+S, 18.0 months for dCRT, 14.5 months for CT, 7.0 months for RT, and 3.2 months for BSC (Figure). A comparison between the Neo+S group and dCRT demonstrated a significant improvement in survival (p=0.02). Further subdivision of the surgical group into neoadjuvant CRT or chemotherapy did not reveal a significant

difference in survival (p=0.6). Utilizing IPTW to adjust for confounding factors, Neo+S increased its survival advantage.

**Conclusion:** The retrospective cohort findings suggest that neoadjuvant therapy followed by surgery may represent the optimal approach for managing esophageal cancer patients with cervical LNMs. Yet, it's vital to recognize the influence of confounding by indication, which statistical adjustments may not entirely rectify. Furthermore, immortal time bias notably skews results favorably toward surgery. Nevertheless, the results emphasize the importance of considering surgery as a viable option for these patients. These limitations underscore the critical need for a prospective study, prompting the launch of the NODE-II trial.
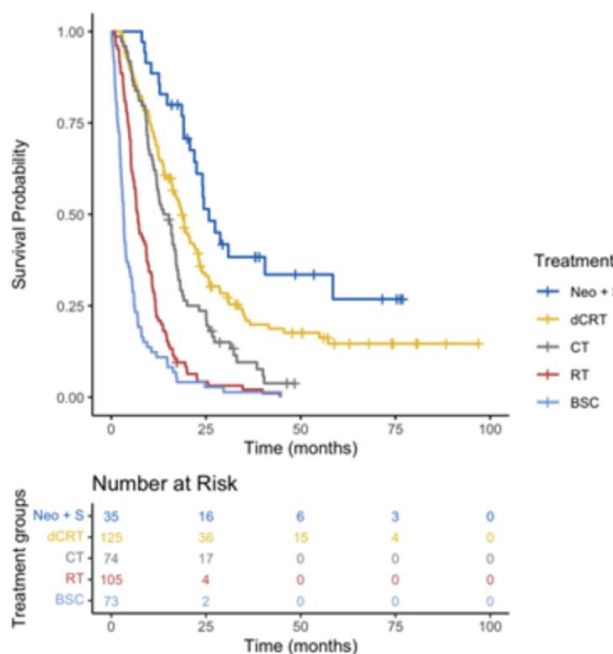


### 9. Chemical Hip Denervation using Phenol via Pericapsular Nerve Group (PENG) Block in Non-Operative Management for Frail Older Hip Fracture Patients: A Multicenter Retrospective Cohort Study

*Thamar Kroes*

**Background:** Effective analgesia is critical yet challenging in non-operative management (NOM) of hip fractures for frail older patients in the palliative setting. Chemical hip denervation with phenol via PEricapsular Nerve Group (PENG) block has been applied to improve pain management.

**Methods:** This is the first multicenter retrospective study that evaluated pain experience, opioid consumption and mobility in this population.

The study included 185 patients, aged 70 years or older, who received chemical hip denervation with phenol via PENG block in the context of NOM from January 2022 until August 2023 in six hospitals across the Netherlands. Data was collected from the Electronic Patient File.

**Results:** Patients were aged median 87 years (IQR 82-91) with multiple comorbidities, the majority suffered from cognitive impairment (74%) and depended on daily care (88%). Phenol was mostly used with a concentration of 6% (70%) or 10% (23%) and a median volume of 10ml (IQR 8-10). Pain was experienced as acceptable in the majority of patients (89% rest-related, 65% care-related). NRS scores and Morphine Milligram Equivalents were low and mobility remained limited. Median survival was 9 days (IQR 4-23). Significant differences were observed in fracture type and hospital location. No complications were reported.

**Conclusion:** Chemical hip denervation with phenol via PENG block is a viable analgesic option in selected frail older hip fracture patients as part of person-centered, multidisciplinary palliative care. Future clinical studies should prospectively evaluate quality of life, rest- and care-related pain. Further research is necessary to define optimal techniques, phenol percentage and volumes and reduce practice variability.

### 10. Surgical outcomes and prognosis of HER2+ invasive breast cancer patients with a DCIS component treated with

**breast-conserving surgery after *neoadjuvant systemic therapy***
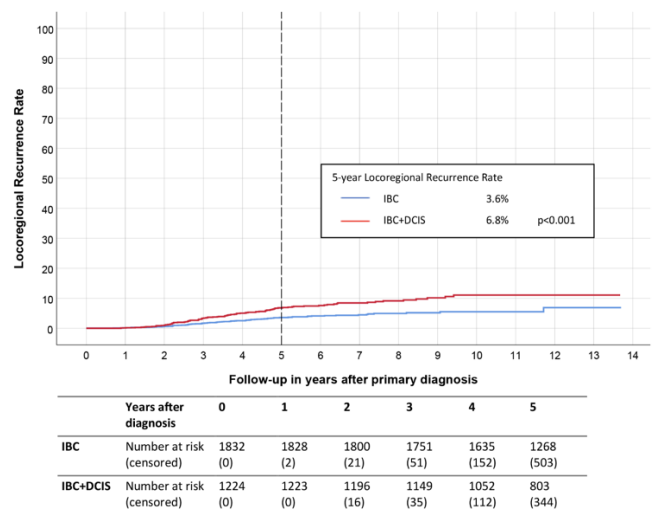*Roxanne Ploumen*

**Introduction:** A ductal carcinoma in situ (DCIS) component is present in more than 50% of patients with HER2+ invasive breast cancer (IBC) and is associated with a higher incidence of positive surgical margins following breast-conserving surgery (BCS). Patients with HER2+ IBC are often treated with neoadjuvant systemic therapy (NST), and up to 60% can achieve a pathological complete response (pCR). Recent studies also demonstrate a potential complete response of the DCIS component. The aim of this study was to assess surgical margins, recurrence and survival in a nationwide cohort of HER2+ IBC with versus without a DCIS component, treated with NST and BCS.

**Materials and methods:** All women with HER2+ IBC treated with NST and BCS, diagnosed between 2010-2019, were selected from the Netherlands Cancer Registry and linked to the Dutch Nationwide Pathology Databank. Kaplan-Meier and Cox regression analyses were performed to determine locoregional recurrence rate (LRR) and overall survival (OS), and associated clinicopathological variables. Surgical outcomes and prognosis were compared between IBC only and IBC+DCIS.

**Results:** A total of 3056 patients were included: 1832 with IBC and 1224 with IBC+DCIS. Patients with IBC+DCIS had significantly more often positive surgical margins compared to IBC (12.8% versus 4.9%, p<0.001). Five-year LRR was significantly higher in patients with IBC+DCIS compared to IBC (6.8% versus 3.6%, p<0.001, Figure), but the presence of DCIS itself was not significantly associated with LRR after adjusting for confounders in multivariable analysis. Five-year OS did not differ between

IBC+DCIS and IBC (94.9% versus 95.7%, p=0.293). Achieving pCR (ypT0) was the most important predictor for survival.
**Conclusion:** The presence of DCIS is associated with higher rates of positive surgical margins. However, the DCIS component itself did not influence LRR and OS, after adjusting for confounders. Further research is necessary to more adequately select IBC+DCIS patients for BCS after NST.



| | Years after diagnosis | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| IBC | Number at risk (censored) | 1832 (0) | 1828 (2) | 1800 (21) | 1751 (51) | 1635 (152) | 1268 (503) |
| IBC+DCIS | Number at risk (censored) | 1224 (0) | 1223 (0) | 1196 (16) | 1149 (35) | 1052 (112) | 803 (344) |

## 11. Short-term Host Response on Electrospun P4HB Scaffold in Sheep
*Krista van Rest*

**Background**: Pelvic organ prolapse (POP) occurs in approximately 50% of women. POP derives from weakened supportive tissue of the pelvic floor and results in prolapse of the uterus, bladder or intestine. We hypothesized that high failure rates in current prolapse surgeries are due to disturbed or delayed wound healing caused by lower tissue regeneration and estrogen depletion. Our earlier absorbable poly-4-hydroxybutyrate (P4HB) knit implants showed improved cell and tissue response leading to a reduction in complications from prolapse surgery in vivo. We now aim to enhance wound healing and improve surgical outcomes by using electrospun P4HB scaffold (ES P4HB) that emulates natural tissue

structure. We further incorporated estradiol (E2) into the scaffold (ES P4HB-E2) to enhance tissue regeneration since E2 is a prominent factor in wound healing in elderly women who are at risk of prolapse.

**Methods:** In this preclinical study, we report the short-term host response to ES P4HB and ES P4HB-E2, as compared to native tissue repair (NTR) in a vaginal sheep model. Parous Dohne Merino sheep underwent posterior vaginal wall implantation of either P4HB (n=6) or 17β-estradiol releasing P4HB (n=6) scaffolds, or underwent NTR (n=4). We evaluated vaginal explants in terms of gross necropsy, histomorphology, biomechanics, tissue-integration and degradation of P4HB at 3-months post-implantation.

**Results:** Results show a mild short-term host response to both scaffolds evidenced by higher collagen and immune cell infiltration compared to NTR.

**Conclusion:** Thus, it seems electrospun P4HB scaffolds improve tissue integration and healing. Further long-term studies are needed to analyze the safety and efficacy of these scaffolds before they may be used in clinical practice.

## 12. Functional assessment of the future liver remnant: a retrospective case study comparing portal vein embolization vs radiation lobectomy
*Rosalie van Rees*

**Introduction:** Liver resection is a potentially curative treatment option for patients with liver cancer. Insufficiency of the future liver remnant (FLR) might preclude surgical treatment as it is associated with an increased risk of post-hepatectomy liver failure (PHLF). Portal vein embolization (PVE) is the current gold standard to induce hypertrophy of the FLR, but tumor progression might occur during the response period. A newly developed technique, radiation lobectomy, makes use of irradiation, enabling

concurrent tumor control. The most commonly used strategy to assess the FLR is image-guided volumetry. However, 99mTc-mebrofenin-hepatobiliary-scintigraphy (HBS) provides direct functional assessment of the FLR and may thus more accurately predict PHLF. Since no comparative functional assessment of both treatment strategies has been performed, this study aimed to compare FLR-functional changes after PVE and RL.

**Methods:** This non-interventional retrospective cohort study was performed at the University Medical Centre Utrecht between 2016-2024. Patients with colorectal liver metastases who underwent PVE or RL due to insufficiency of the FLR (HBS <2.7%/min/m2) were included. HBS was performed before and 1 month (PVE) or 2-3 months (RL) after treatment. Secondary outcome measures included perioperative characteristics.

**Results:** Baseline criteria did not differ between groups. The FLR-function significantly increased after PVE and RL (p= 3·10-3 and p=3·10-3, respectively). The median duration to achieve sufficient FLR-function was longer for RL- than PVE-treated patients (75 days (58-167) vs 31 days (21-128), p=2·10-3). The mean increase of FLR function was 78.2% ± 56.4 after PVE and 100.6% ± 85.1 after RL (p=0.55). PHLF and resection margins were comparable among groups. There was no 90-day mortality.

**Conclusion:** Both PVE and RL effectively increased FLR-function. A sufficient FLR-function was achieved faster in the PVE-cohort. Further research in larger, prospective cohorts should be conducted to test the hypothesis that FLR-function induction might be more pronounced after RL than PVE.

## 13. Finding the optimal treatment for neuroma pain
*Catherine van den Berg*

**Introduction:** Peripheral nerve injury frequently results from trauma or surgery, leading to neuroma formation at the site of nerve transection, regardless of whether the nerve is repaired. Neuromas can send pain signals, causing conditions such as allodynia, hyperalgesia, and hypersensitivity. Approximately 8% of affected individuals experience persistent pain. Pharmacological treatments, including antidepressants, anticonvulsants, and lidocaine, often fail to provide long-term relief and carry significant side effects. Surgical treatment, though promising, lacks comprehensive understanding and consistent efficacy in clinical practice.

**Methods:** An animal study was conducted to investigate neuroma pathophysiology and compare surgical interventions. Seventy-five 10-week-old Sprague-Dawley rats were randomized into five groups: targeted muscle reinnervation, muscle burying, nerve capping, tibial transposition (positive control), or sham (negative control). Pain was assessed through careful monitoring of discomfort, self-mutilation. Hyperalgesia, and hypersensitivity in adjacent nerves was assessed using Von Frey filaments. Resting pain was evaluated using the conditioned place preference(CPP) test. At 15 weeks, tissue samples, including neuromas, sciatic nerves, spinal cords, and dorsal root ganglia, were collected following sacrifice.

**Results:** We will present our preliminary results from von Frey measurements and discuss the observed differences. Finally, we will share our experiences with the CPP test as a pain assessment tool in translational neuroma research.

**Conclusion:** Pain caused by neuromas can be debilitating for patients. Translational research provides an opportunity to gain insight into the histological characteristics of painful neuromas, identifying potential treatment targets, and determining which therapeutic approach offers the highest likelihood of success.

## 14. The reliability of the Lane-Sandhu score and the modified RUST for assessment of postoperative radiographs of long bone non-unions and bone defects
*Laureanne Lodewijks*

**Introduction:** Radiographic assessment of bone healing is challenging, especially in postoperative bone defects and non-union. For clinical practice, and in particular research, quantification of bone healing can be of interest. Scores, such as the (modified) Radiographic Union Score for Tibial fractures ((m)RUST) are widely known. The Lane-Sandhu score, a lesser-known score for bone defects, may have benefits over the mRUST score. The aim of this study is to compare inter- and intraobserver reliability of the Lane-Sandhu score with the mRUST.

**Methods:** First, five postoperative radiographs were scored by five observers using the mRUST and modified Lane-Sandhu score individually. Pitfalls of the scores were thereafter analyzes in a trainings session. Finally, each observer scored ten new radiographs. The intraclass correlation coefficient (ICC) was calculated to determine intra- and interobserver reliability of the scores for each session. Sub analyses were performed for different fixation methods.

**Results:** The pilot session resulted in an interobserver reliability of 0.48 for the mRUST and -0.049 for the Lane-Sandhu score. During the training session, the interobserver reliability scores were 0.50 and 0.14 respectively. The final session resulted in an ICC of 0.79 (95% CI 0.60-

0.91) for the mRUST and 0.76 (0.59-0.88) for the Lane-Sandhu. Both reliability scores are classified as good with no statistical significant difference between the two scores. The reliability was similar in different fixation methods.

**Conclusion:** Both scores are reliable scoring systems for the interpretation of



Interobserver reliability
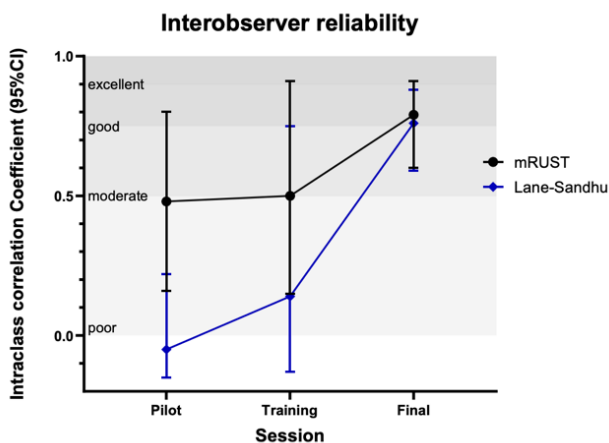
postoperative bone defects and nonunion. There is a slight preference for the mRUST because the reliability was less dependent on the training session. For future research, the interpretation of postoperative radiographs should be well described and a training session is recommended.

## 15. Fracture rate after conventional external beam radiation therapy to the spine in multiple myeloma patients
*Jens te Velde*

**Background:** Conventional external beam radiation therapy (cEBRT) is used in multiple myeloma (MM) to treat severe pain, spinal cord compression, and disease-related bone disease. However, radiation may be associated with an increased risk of vertebral compression fractures (VCFs), which could substantially impair survival and quality of life. Additionally, the use of the Spinal Instability Neoplastic Score (SINS) in MM is debated in MM.

**Purpose:** To determine the incidence of VCFs after cEBRT in patients with MM and to assess the applicability of the SINS score in the prediction of VCFs in MM.

**Study design:** Retrospective multicenter cohort study.

**Patient sample:** MM patients with spinal myeloma lesions who underwent cEBRT between January 2010 and December 2021.

**Outcome measures:** Frequency of new or progressed VCFs and subdistribution hazard ratios for potentially associated factors.

**Methods:** Patient and treatment characteristics were manually collected from the patients' electronic medical records. Computed tomography (CT) scans from before and up to 3 years after the start of radiation were used to score radiographic variables at baseline and at follow-up. Multivariable Fine and Gray competing risk analyses were performed to evaluate the diagnostic value of the SINS score to predict the post-radiation VCF rate.

**Results:** A total of 127 patients with 427 eligible radiated vertebrae were included in this study. The mean age at radiation was 64 years, and 66.1% of them were male. At the start of radiation, 57 patients (44.9%) had at least one VCF. There were 89 pre-existing VCFs (18.4% of 483 vertebrae). Overall, 39 of 127 patients (30.7%) reported new fractures (number of vertebrae (n)=12) or showed progression of existing fractures (n=36). This number represented 11.2% of all radiated vertebrae. Five of the 39 (12.8%) patients with new or worsened VCFs received an unplanned secondary treatment (augmentation [n=2] or open surgery [n=3]) within 3 years. Both the total SINS score (SHR 1.77; 95% confidence interval (CI) 1.54−2.03; p<.001) and categorical SINS score (SHR 10.83; 95% CI 4.20−27.94; p<.001) showed an independent association with higher rates of new or progressed VCFs in adjusted analyses. The use of bisphosphonates

was independently associated with a lower rate of new or progressed VCFs (SHR 0.47 [95% CI 0.24−0.92; p=.027]).

**Conclusions:** This study demonstrated that new or progressed VCFs occurred in 30.7% of patients within 3 years, in a total of 11.2% of vertebrae. The SINS score was found to be independently associated with the development or progression of VCFs and could thus be applied in MM for fracture prediction and possibly prevention.

## 16. Activation of the systemic innate immune response indicates more tissue damage during pancreaticoduodenectomy compared to CABG; a pilot study
*Emma de Fraiture*

**Introduction**: Major surgery triggers an innate immune response, which can become excessive and prolonged, and can lead to immune suppression and increased risk of infection. Neutrophils are crucial in the inflammatory response to tissue injury, and changes in their phenotype are associated with the severity of the innate immune response. This study describes the effect of major surgery on the occurrence of neutrophil phenotypes using automated point-of-care flow cytometry.

**Methods:** This prospective single-center cohort study included adult patients undergoing either pancreaticoduodenectomy or on-pump coronary artery bypass grafting (CABG) as part of the 'Biomarkers to guide perioperative management and improve outcome in high-risk surgery (BIGPROMISE)' study. Blood samples were collected at three time points: after anesthesia induction (preoperative), immediately after surgery, and on postoperative day 3 (POD 3). Neutrophil phenotypes were assessed by automated 24/7 flow cytometry.

**Results:** The study enrolled 24 patients undergoing CABG and 12 undergoing pancreaticoduodenectomy. Preoperatively, most patients exhibited minimal neutrophil heterogeneity. Postoperatively, all patients displayed significant changes in neutrophil subsets (categorized as 0-6), indicative of acute systemic inflammation. Patients who underwent pancreatic surgery showed a more extensive inflammatory response, with 83% in category 5, compared to 29% in the CABG group. Persistent hyperinflammation on POD 3 was observed twice as frequently after pancreatic surgery compared to CABG (25% vs 13%).

**Conclusions:** This study demonstrates that activation of the systemic innate immune response indicates more tissue damage during pancreaticoduodenectomy compared to CABG and marked heterogeneity in the severity and duration of postoperative inflammation in both types of major surgery. These findings suggest a dysregulated postoperative inflammatory response driven by DAMP-regulated innate immune mechanisms. Further research is needed to validate the clinical utility of neutrophil subsets in predicting postoperative outcomes and guiding clinical management.

## 17. Intraoperative margin assessment in oral cancer using fluorescence guided surgery and fresh frozen sectioning
*Bas Keizers*

**Objectives:** The aim of this study is to develop a protocol for margin assessment during oral cancer surgery using the fluorescent tracer cetuximab-800CW. The protocol tested supports clinical decision making for margin adjustment by combining fluorescence imaging with fresh frozen sectioning (FFS).

**Materials and Methods:** In this study a total of 21 patients will be included. After

written informed consent, the fluorescent tracer cetuximab-800CW is administered intravenously. Two days later, standard of care surgery is performed. At two points immediately after tumor excision fluorescence images of the margins will be studied: immediately after removal of the tumor on the excised tumor specimen and after the specimen is freshly cut into breadloaf tissue slices. FFS with H&E staining will be performed if: (i) a fluorescent spot is detected on the excised specimen, or (ii) an inadequate margin is suspected based on the tumor fluorescence in tissue slices. When an inadequate margin (margin 5 mm, increasing specificity of this protocol to 100%. Based on this intraoperative assessment, all inadequate margins were adjusted during initial surgery, thereby improving surgical margins and reducing the need for adjuvant treatment.

**Conclusion:** Analysis of this clinical trial shows that our protocol of fluorescence analysis of freshly cut tumor tissue slices combined with fresh frozen sectioning is highly effective in identifying inadequate margins in all patients. Intraoperative margin assessment in oral cancer with fluorescent tracers most likely will have a great impact on cancer surgery.

## 18. The Safety and Accuracy of Radiation-Free Spinal Navigation Using an Ultrashort, Scoliosis-Specific BoneMRI-protocol Compared to CT
*Peter Lafranca*

**Background:** Spinal navigation systems require pre- and/or intra-operative 3-D imaging, which expose young patients to harmful radiation. We developed a scoliosis-specific MRI-protocol that provides T2-weighted MRI and AI-generated synthetic-CT (sCT) scans in one, 11-minute examination. sCT uses MRI data to create CT-like images through deep learning algorithms. This study aims to compare MRI-based synthetic-CT spinal navigation to CT for safety and accuracy of pedicle screw planning and placement at thoracic and lumbar levels.

**Methods:** Spines of 5 cadavers were scanned with thin-slice CT and the scoliosis-specific MRI-protocol (to create sCT). Preoperatively, on both CT and sCT screw trajectories were planned. Subsequently, four spine surgeons performed surface-matched, navigated placement of 2.5mm k-wires in all pedicles from T3 to L5. Randomization for CT/sCT, surgeon and side was performed (1:1 ratio). On postoperative CT-scans, virtual screws were simulated over k-wires. Medial breach rate was assessed using the Gertzbein-Robbins classification, with Grade A and B considered satisfactory. Maximum angulation and distance between planned and postoperative screw positions were also evaluated.

**Results:** Screw planning and surface-matched registration was possible with both modalities. 140 k-wires were inserted, 3 were excluded. There were no pedicle breaches >2mm. Of the CT-guided screws, 47 were grade A and 21 grade B. For sCT-guided screws, 59 were grade A and 10 grade B (p=0.022). Average distance (±SD) between intraoperative and postoperative screw positions was 2.4 ± 1.8mm in CT-guided screws, and 2.3 ± 1.5mm for sCT (p=0.78) and average maximum angulation (±SD) was 3.9 ± 2.9° for CT and 3.8 ± 2.5°for sCT (p=0.75).

**Conclusions:** MRI-based, AI-generated synthetic-CT spinal navigation is feasible and allows for safe and accurate planning and placement of thoracic and lumbar pedicle screws, with no significant difference in distance and angulation between planned and postoperative screw positions compared to CT. The use of radiation-free spinal navigation is

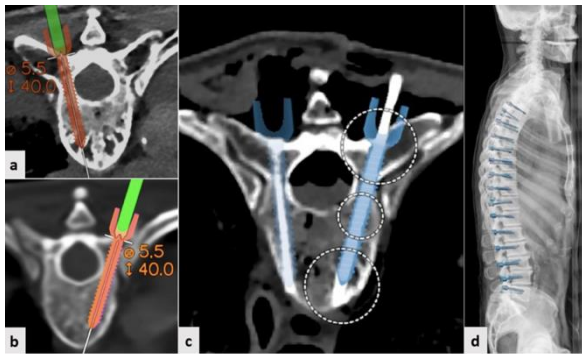promising and should be further explored, especially in pediatric spinal surgery.



Figure 1: (a) Example of planned intraoperative screw position in thoracic vertebra on a CT-scan; (b) example of planned intraoperative screw position in thoracic vertebra on a sCT scan; (c) axial CT-scan with virtual screw positioned over the k-wire (c) sagittal reconstruction of postoperative wires screws in the navigation software.

## 19. Review on Diagnostic and Treatment Delay of Giant Cell Tumor of Bone

*Mylène Duivenvoorden*

**Introduction:** Giant Cell Tumor of Bone (GCTB) is an intermediate and locally aggressive tumor. A delay can be categorized in patient-related delays, delays in referral by general practitioners, and delays in the diagnostic process. Hypothetically, a longer delay may lead to a higher Campanacci grade and consequently more invasive surgery, with a significant lifelong impact for these young patients.

**Methods:** We conducted a systematic review on 9 February 2023, using databases including Medline, Embase and Cochrane. After screening 5232 articles, 2080 articles remained. Subsequently, these 2080 articles were searched for the keyword "delay" in all fields (title, abstract, or article), and this refined the selection to 65 articles. All 65 articles underwent a thorough review, including critical appraisals. After this process, we included 15 articles comprising 34 cases, with 32 cases being subject to analysis.

**Results:** Overall, 32 cases were identified with a median age of 29 years (IQR 24-41). The majority was female (59%, n=19). GCTB was located in the foot (22%), spine (19%), distal ulna (16%) and other (43%). Campanacci grading 2 and 3 were found

in respectively 16% and 81% of cases. The median delay in diagnosis was 5.5 months (IQR 3.0-13.5).

Thirteen patients reported experiencing patient-related delays, median delay of 6 months (IQR 3-35). Nineteen patients encountered referral delays, median of 4 months (IQR 3-12). Diagnostic delay was reported in 4 patients, with a median delay of 2.5 months (IQR 1-4).

**Conclusion:** This review confirms a diagnostic delay in GCTB. Several underlying causes were found and Campanacci grade 3 was mostly present. The cases described in this review were not representative of the general GCTB population. Based on these findings no conclusions can be drawn on the clinical consequences, and further research is necessary to determine the effect of delay on GCT.

## 20. Hospital Volume and Real-World Outcomes After Surgical Myectomy in a Nationwide Study

*Tijn Heeringa*

**Objectives:** Previous studies on outcomes after surgical myectomy in hypertrophic obstructive cardiomyopathy (HOCM) patients have not yet been investigated in a nationwide registry with detailed clinical data. Hence, the objectives of this nationwide study are to describe the 30-day clinical outcomes and first postoperative echocardiography measurements after surgical myectomy, and to assess which factors are associated with higher 30-day complication rates.
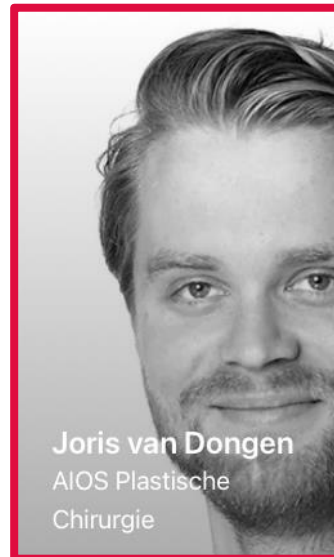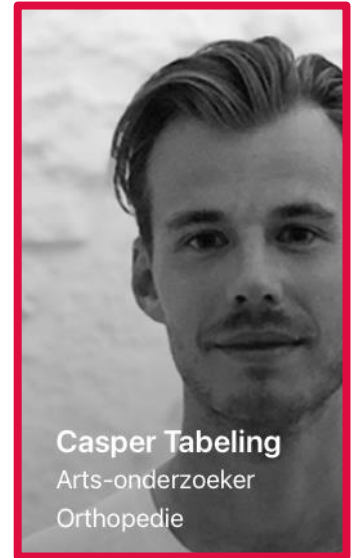
**Methods and Results:** All HOCM patients (n = 335), operated between January 2012 and December 2020 at 12 different Dutch hospitals, were analysed. Multiple logistic regression analyses assessed factors associated with a higher 30-day complication rate. Isolated surgical myectomy was performed in 26%, surgical

myectomy with one concomitant procedure in 56%, and surgical myectomy with two or more concomitant procedures in 18% of HOCM patients. 30-day complication rates concerned mortality (5%), ventricular septal defect (2%), stroke (3%), and surgical reoperation (2%). The mean resting left ventricular outflow tract (LVOT) gradient improved from 61 ± 30 mmHg to 13 ± 12 mmHg postoperatively (p value < .001), systolic anterior motion improved from 80% to 8% (p value < .001), and mitral regurgitation grade 3 or 4 from 31% to 6% (p value < .001). The adjusted 30-day complication rate was higher in female gender (odds-ratio [OR] 4.50 [95% confidence interval [CI] 1.98–11.17]; p value < .001), concomitant procedures (OR 6.63 [95% CI 1.84–31.74]; p value < .007), low-volume hospitals (OR 3.25 [95% CI 1.41–8.25]; p value < .008).

**Conclusion:** This nationwide study describes various clinical outcomes after surgical myectomy and demonstrates that surgical myectomy effectively relieves LVOT obstruction in 93% of all patients. Female gender, concomitant procedures, and low-volume hospital volume are associated with higher 30-day complication rates. Although a potential inverse volume-outcome relation was found, this must be interpreted cautiously given the power of this study.

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