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Clinical comparison between two propofol pumps for general anaesthesia

Submission date
30/09/2022

Recruitment status
No longer recruiting

Registration date
25/10/2022

Overall study status
Completed

Last Edited
18/11/2024

Condition category
Surgery

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
General anaesthesia can be delivered by intravenous drugs such as Propofol. In recent years various methods have been proposed to estimate the concentration in blood and at the brain (effector site) of this drug, utilizing pharmacokinetic and pharmacodynamic calculations. Eleveld and Schnider model are 2 of the Propofol model most commonly used in the clinical practice to deliver Propofol for general anaesthesia, however, their accuracy in predicting concentrations are different. The aim of this study is to evaluate if there are differences in estimating concentrations at loss of consciousness, return of consciousness and during general anaesthesia, as well as to compare if superificliazation or deepening events incidence is different between the 2 models, during Bispectral Index guided anesthesia.

Who can participate?
Adult women undergoing general anesthesia with TCI, undergoing breast surgery.

What does the study involve?
The procedure will proceed as usual, using TCI pumps with Eleveld and Schnider models

What are the possible benefits and risks of participating?
None

Where is the study run from?
Azienda ULSS 2 Treviso (Italy)

When is the study starting and how long is it expected to run for?
October 2022 to December 2022

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Dr Linassi Federico, federico.linassi@aulss2.venero.it

Contact information

Type(s)
Principal investigator

Contact name
Dr Federico Linassi

Contact details
Piazza Ospedale 1
Treviso
Italy
31100
+39 (0)422322410
Federico.linassi@aulss2.Veneto.it

Additional identifiers

Protocol serial number
280922

Study information

Scientific Title
Schnider versus Eleveld propofol target controller infusion model: a clinical comparison evaluating concentration at the effector site of propofol at loss of responsiveness during anesthesia maintenance and return of responsiveness

Study objectives
During recent years Eleveld and colleagues ideated a new propofol pharmacokinetic /pharmacodynamic (PK/PD) model for total intravenous anaesthesia with target controlled infusion (TIVA-TCI) pumps that has been proposed to have slightly better predictive performance for measured propofol plasma concentrations compared with those of the Marsh and Schnider models, and suitable for children, adults, older subjects, and obese adults, being considered as a “General purpose” model.

However, no trials have compared the Eleveld to the Schnider model from a clinical point of view; so, this study aimed to compare the estimated effector site concentration of the two models (CePE and CePS, respectively) at loss of responsiveness (LoR), during anaesthesia maintenance (Bispectral Index [BIS] 40-60) and return of responsiveness (RoR). The study also compared the incidence of deepening or superficializing anaesthesia (defined respectively as lowering or increasing in out-of-target BIS after initial CeP detection), as well as unwanted anaesthesia events: burst suppression (BSupp, identified as a burst suppression ratio [BSR] >0) and unwanted spontaneous responsiveness.

Ethics approval required
Old ethics approval format

Ethics approval(s)

Approved 20/01/2022, comitato etico di Treviso-Marca trevigiana (ospedale va Foncello, piazza ospedale 1, Treviso, Italy; +39 422328306; nrcaulss9@aulss2.Veneto.it), ref: 681/CE

Primary study design
Observational

Study design
Observational cohort study

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
General anaesthesia

Interventions
This study will enrol 78 patients who are undergoing breast oncologic surgery. Estimating the mean and standard deviation (SD) from the median and range of the Median Absolute Performance Error (MAPE) between the Eleveld PK-PD model and the Schnider PK-PD model in adults, the sample size was based on the following assumptions: a significant MAPE difference of 4% between the Eleveld PK-PD model and the Schnider PK-PD model in adults, an SD of 6.3%, type I error equal to 0.05, and type II error equal to 0.2 (power [1-β] = 0.8). Considering these assumptions, the sample size was calculated as 78 patients, equally divided between the Eleveld PK-PD model group (39 patients) and the Schnider PK-PD model group (39 patients).

Induction and maintenance of anaesthesia were performed with TIVA-TCI. CeP and Ce of remifentanil (CeR) were achieved using the uSP6000 syringe pump infusion system (Arcomed ag, Steineckerstrasse 29 CH-8302 Kloten (Switzerland) using the Schnider or Eleveld model for Propofol, and Minto for remifentanil.

After standard vital parameters monitoring including also Bispectral Index (BIS) using an XP monitor (Monitor BIS Module A-2000 Revision 3.12) with a bilateral electrode BIS (Covidien IIC, 15 Hampshire Street, Mansfield, MA 02048 USA) on the forehead of the patient, induction was started according to our hospital protocol, setting a CeP target of 0.5 μg ml-1, with increments of 0.5 μg ml-1 intervals when the estimated CeP equilibrated with target CeP. CeR was settled at 0.8 ng ml-1 until LoR (defined as loss of responsiveness to verbal commands), when both CeP and CeR were placed at 3 μg ml-1 and 3 ng ml-1, respectively. Then, a laryngeal mask Airways (LMA) was placed. During anaesthesia maintenance, CeP was adjusted to a target BIS of 40–604 by changes of 0.5 μg/ml at intervals of ≥1 min until BIS returned to the suggested range. The initial CeP during maintenance was defined as the CeP reached after a stable BIS for >10 minutes without CeP target changes. According to the protocol, if during maintenance the patient manifested any out-of-target BIS, the researchers set a new target concentration that, once the BIS returns in range for >10 minutes, was registered as final CeP. At the end of surgery, TIVA-TCI was targeted to a CeP of 0 μg/ml and a CeR of 0 ng/ml. With the return of spontaneous ventilation at RoR, defined as spontaneous eye-opening and execution of simple commands, the LMA was removed.

Intervention Type
Other

Primary outcome(s)

1. Concentration of propofol at loss of consciousness, return of consciousness and during maintenance measured using the display on the equipment
2. Occurrence of deep or light anesthesia during the procedure measured using EEG

Key secondary outcome(s)
Measured during the procedure measured using EEG:
1. Episodes of deepening anesthesia (BIS <40)
2. Superficializing anesthesia (BIS >60)
3. Burst suppression
4. Unwanted spontaneous responsiveness

Completion date
25/12/2022

Eligibility

Key inclusion criteria
Women undergoing general anesthesia with TIVA-TCI for breast surgery

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
Female

Key exclusion criteria
1. Patients with any neurologic/respiratory/liver/kidney diseases
2. Patients taking any psychiatric drugs, including benzodiazepines

Date of first enrolment
30/10/2022

Date of final enrolment
25/12/2022

Locations

Countries of recruitment
Italy

Study participating centre

Azienda ULSS2 Marca Trevigiana
Piazzale Ospedale 1
Treviso
Italy
31100

Sponsor information

Organisation
Azienda ULSS 2 Treviso

Funder(s)

Funder type
Other

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.
Federico.linassi@aulss2.veneto.it

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		16/10/2023	18/11/2024	Yes	No