SmartPilot View
List of references

Dräger

Technology for Life

Evidence level	Author	Title	Publication	Page
I	Leblanc D et al.	SmartPilot® View-guided anaesthesia improves postoperative outcomes in hip fracture surgery: a randomized blinded controlled study	BJA 2017; 119(5):1022-1029	8
I	Luginbuehl M et al.	Noxious stimulation response Index (NSRI): Validation of a novel anesthetic depth index	Anesthesiology 2010; 112(4):872-80	1
I	Morimoto Y et al.	The usefulness of Smart Pilot View for fast recovery from desflurane general anesthesia	Journal of Anesthesia 2021; 35:239–245	7
I	Strand H et al.	Effectiveness of the advisory display SmartPilot® view in the assessment of anesthetic depth in low-risk gynecological surgery patients: a randomized controlled trial	BMC Anesthesiology 2022; 22:57	8
II	Cirillo V et al.	Navigator® and SmartPilot® View are helpful in guiding anesthesia and reducing anesthetic drug dosing	Minerva Anestesiol. 2015; 81:1163-1169	7
II	Kuizenga MH et al.	Utility of the SmartPilot® View advisory screen to improve anaesthetic drug titration and postoperative outcomes in clinical practice: a two-centre prospective observational trial	BJA 2022; 128(6):959-970	12
II	von Dincklage F et al.	Utility of Nociceptive Flexion Reflex Threshold, Bispectral Index, Composite Variability Index and Noxious Stimulation Response Index as measures for nociception during general anaesthesia	Association of Anaesthetists 2012; 67(8): 815-936	7
III	Hannivoort LN et al.	Drug interaction models are better predictors of tolerance/response to noxious stimuli compared to individual measured parameters	EJA 2013; 30: 1-2	1
III	Inan G et al.	Evaluating the role of Smartpilot® view assisted target-controlled infusion anesthesia during intracranial mass surgery: A comparative retrospective study with bispectral index-guided standard anesthesia	J Surg Med 2021; 5(9):884-8	5
III	Inan G, Satirlar Ozkose Z	Target Controlled Infusion via Smartpilot? view for Neuromonitoring in Neurosurgical Patients: A Novel Technology	Clin Surg. 2021; 6: 3165	5
III	Inan G et al.	The Effect of Smartpilot® View, A New Decision Support System on Recovery and Anesthetic Consumption in Spinal Surgery: A Retrospective Study	JARSS 2021; 29(4):226-32	7
V	Mai S et al.	Complementary Use of Effect Site-Target Controlled Infusion and SmartPilot View for Anesthetic Management in Semi-awake Craniotomy Near BIS 85	J Neurosurg Anesthesiol. 2018; 30(1):78-79	1
V	Struys MMRF et al.	Optimizing intravenous drug administration by applying pharmacokinetic/pharmacodynamic concepts	BJA 2011; 107(1): 38–47	10

Evidence level	Author	Title	Publication	Page
I	Leblanc D et al.	SmartPilot® View-guided anaesthesia improves postoperative outcomes in hip fracture surgery: a randomized blinded controlled study	BJA 2017; 119(5):1022-1029	8

Summary

Aim: The study investigates whether computer-assisted anaesthesia can improve the depth of anaesthesia and the outcome of patients undergoing hip surgery. The SmartPilot® View software, which uses pharmacokinetic and pharmacodynamic models for calculation, is used to visualise the depth of anaesthesia.

Design: Prospective, randomized, single-centre, blinded trial

Institute: Département Anesthésie Réanimation, Maison de la recherche and Département de chirurgie osseuse, CHU Angers, Angers, Frankreich

Subjects: 97 patients (age from 18 to 90 years) ASA I to III 40-140 kg, 150-200 cm, general anaesthesia

Method: In the intervention group, anaesthesia was guided using SPV with predefined targets (The dark grey isobole (MAC 50 - MAC 90) was the target for the intubation and incision, the medium grey isobole (TOSS 90 - MAC 50) was the target for the rest of the anaesthesia and the light grey isobole (TOSS 50 - TOSS 90) was the target for the suture). In the control group, anaesthesia was delivered by usual practice using the same agents (propofol, sufentanil and desflurane). The primary endpoint was the time spent in the “appropriate anaesthesia zone” defined as BIS of 45–60 and systolic arterial pressure of 80–140 mm Hg. Postoperative complications were recorded for one month in a blinded manner.

Results: Of 100 subjects randomised, 97 were analysed (n=47 in SPV and 50 in control group). Anaesthetic drug consumption was reduced in the SPV group (for propofol and desflurane). Intraoperative duration of low BIS (<45) was similar, but cumulative time of low systolic arterial pressure (<80 mm Hg) was significantly shorter in the SPV group (median (Q1-Q3); 3 (0–40) vs 5 (0–116) min, P=0.013). SPV subjects experienced fewer moderate or major postoperative complications at 30-days (8 (17)% vs 18 (36)%, P=0.035) and the length of hospitalisation was shorter (8 (2–20) vs 8 (2–60) days, P=0.017)).

Conclusion: SmartPilot View-guided anaesthesia reduces intraoperative hypotension duration, occurrence of postoperative complications and length of stay in hip fracture surgery patients.

Study

Evidence level	Author	Title	Publication	Page
I	Luginbuehl M et al.	Noxious stimulation response Index (NSRI): Validation of a novel anesthetic depth index	Anesthesiology 2010; 112(4):872-80	1

Summary

Aim: The aim of the study was to validate the NSRI on previously published data. The noxious stimulation response index (NSRI) is a novel anaesthetic depth index ranging between 100 and 0, computed from hypnotic and opioid effect-site concentrations using a hierarchical interaction model.

Design: Randomised, controlled study

Institute: Anesthesiology and Pain Therapy, Bern University Hospital, Bern, Switzerland

Subjects: 44 female patients, ASA- I

Method: The data encompassed 44 women, American Society of Anesthesiology class I, randomly allocated to three groups receiving remifentanil infusions targeting 0, 2, and 4 ng/ml. Propofol was given at stepwise increasing effect-site target concentrations. At each concentration, the observer assessment of alertness and sedation score, the response to eyelash and tetanic stimulation of the forearm, the bi-spectral index (BIS), and the acoustic evoked potential index (AAI) were recorded. The authors computed the NSRI for each stimulation and calculated the prediction probabilities (PKs) using a bootstrap technique. The PKs of the different predictors were compared with multiple pairwise comparisons with Bonferroni correction.

Results: The median (95% CI) PK of the NSRI, BIS, and AAI for loss of response to tetanic stimulation was 0.87 (0.75-0.96), 0.73 (0.58-0.85), and 0.70 (0.54-0.84), respectively. The PK of effect-site propofol concentration, BIS, and AAI for observer assessment of alertness and sedation score and loss of eyelash reflex were between 0.86 (0.80-0.92) and 0.92 (0.83-0.99), whereas the PKs of NSRI were 0.77 (0.68-0.85) and 0.82 (0.68-0.92). The PK of the NSRI for BIS and AAI was 0.66 (0.58-0.73) and 0.63 (0.55-0.70), respectively.

Conclusion: The NSRI conveys information that better predicts the analgesic component of anaesthesia than AAI, BIS, or predicted propofol or remifentanil concentrations. Prospective validation studies in the clinical setting are needed.

Study

Evidence level	Author	Title	Publication	Page
I	Morimoto Y et al.	The usefulness of Smart Pilot View for fast recovery from desflurane general anesthesia	Journal of Anesthesia 2021; 35:239–245	7

Summary

Aim: The study investigates the influence of SmartPilot View (SPV) on the recovery time of patients after general anaesthesia with desflurane .

Design: Prospective, randomised study

Institute: Department of Anesthesia, Ube Industries Central Hospital, Ube, Japan

Subjects: 34 patients, (age from 20 to 70 years,) , ASA I- II

Method: The patients were divided into two groups. In the SPV group, additional SPV data was provided, while this data was not available in the control group. No premedication was administered before the procedure. General anaesthesia was induced with propofol (1-2 mg/kg) and rocuronium (0.6 mg/kg). After the intubation, the end-tidal Desflurane concentration was maintained at 4,2 %. During the procedure, the desflurane concentration was adjusted so that the BIS was between 40 and 60 and above MAC 90, which is displayed as NSRI 20. In the SPV group, the desflurane concentration and the infusion rate of remifentanil were lowered to reach the MAC90 isobole approximately 10 minutes before the end of the procedure. In the control group, the desflurane concentration and the infusion rate of remifentanil were maintained unchanged until the end of the procedure.

Results: The time to eye opening was 292 ± 33 seconds in the control group and 280 ± 55 seconds in the SPV group. The time to regain orientation was 357 ± 53 seconds in the control group and 319 ± 59 seconds in the SPV group. Both times were significantly shorter in the SPV group.

Conclusion: SPV-guided anaesthesia enabled faster recovery from desflurane general anaesthesia.

Study

Evidence level	Author	Title	Publication	Page
I	Strand H et al.	Effectiveness of the advisory display SmartPilot® view in the assessment of anesthetic depth in low-risk gynecological surgery patients: a randomized controlled trial	BMC Anesthesiology 2022; 22:57	8

Summary

Aim: This trial aimed to ascertain the effectiveness of the advisory display SmartPilot View (SPV), as a supplemental measure in the assessment of anaesthetic depth in low-risk gynaecological surgery patients. The hypothesis was that the use of the SPV would increase the precision of assessment, and result in a higher mean arterial pressure.

Design: Randomised, controlled, single-blinded study

Institute: Department of Anesthesiology, Innlandet Hospital Trust, Sykehuset Lillehammer, Lillehammer, Norway; Department of Anesthesiology, Østfold Hospital Trust, Sykehuset Østfold Kalnes, Grålum, Norway; Department of Emergency, Anesthesiology and Intensive Care Unit, Innlandet Hospital Trust, Sykehuset Lillehammer, Lillehammer, Norway; Department of Health Science Gjøvik, Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology, Gjøvik, Norway

Subjects: 114 female patients, aged between 18-75, ASA- I-III

Method: Patients were allocated to two groups: a test group in which the current standards (incl. BIS) were supplemented by the decision support tool SPV (SPV group) and a control group that was anaesthetised according to the current standards. The primary outcome was MAP (mmHg), secondary outcomes were heart rate (beats/min), BIS, total drug dose, extubation delay and time in the recovery room (min). TIVA with propofol and remifentanil was used for anaesthesia in all patients. During anaesthesia, the depth of anaesthesia should be kept within the dark grey isobole range (TOL50 - TOL90), but this was not monitored and recorded during the course of the study.

Results: A total of 114 patients were included in the analysis (test group n=58, control group n=56). No significant differences in the mean arterial pressure, heart rate, BIS, extubation delay, or post-anaesthesia care unit stay were found between groups. The authors suspected that the anaesthetists were influenced by the display of the known BIS when interpreting the SPV data and that the effect of the SPV would have been greater if the BIS values had not been available to assess the depth of anaesthesia. The authors also point out that the results may have been influenced by the fact that it was not recorded whether the depth of anaesthesia was within the target range

Conclusion: The addition of SmartPilot View to the current standards has no significant influence on the result when assessing the depth of anaesthesia.

Study

Evidence level	Author	Title	Publication	Page
II	Cirillo V et al.	Navigator® and SmartPilot® View are helpful in guiding anesthesia and reducing anesthetic drug dosing	Minerva Anestesiol. 2015; 81:1163-1169	7

Summary

Aim: The study investigates whether anaesthesia controlled by Navigator® (GE Healthcare) or SmartPilot View (SPV, Dräger) is associated with good analgesia and depth of anaesthesia as well as lower anaesthetic consumption.

Design: Prospective, non-randomised study

Institute: Department of Neurosciences, Reproductive and Odontostomatologic Sciences, University Federico II, Neapel, Italien; Department of Medicine and Surgery, University of Salerno, Salerno, Italien

Subjects: The study included 60 ASA risk classification I-II patients aged 18 to 75 years

Method: The patients were divided into four groups of 15 people each. In the SPV and Navigator control groups, anaesthesia was guided by standard monitoring, while in the Navigator group and SPV group, anaesthesia guidance was supported by the respective software. During anaesthesia, the following vital signs of the patients were recorded: HF, NIBP, SpO_2, $etCO_2$, etSevo, BIS or entropy, TOF. Recordings were made at 15-minute intervals.

Results: All patients recovered uneventfully and showed haemodynamic stability. End-tidal sevoflurane levels during maintenance of anaesthesia were significantly lower in the SPV [1.1% (0.8-1.5)] and Navigator [1% (0.8-1.8)] groups compared to the SPV control [1.5% (1-2.5)] and Navigator control [1.5% (0.8-2)] groups. BIS and entropy values were higher in the SPV group [53 (46-57)] compared to the control group [43 (37-51)] and in the navigator group [53 (43-60)] compared to the control group [41 (35-51)]. No significant differences in remifentanil dosage were found between the four groups.

Conclusion: Navigator® and SmartPilot View may be of clinical use in monitoring adequacy of anaesthesia. Both displays can optimize the administration and monitoring of anaesthetic drugs during general anaesthesia and may reduce the consumption of volatile anaesthetic agents.

Study

Evidence level	Author	Title	Publication	Page
II	Kuizenga MH et al.	Utility of the SmartPilot® View advisory screen to improve anaesthetic drug titration and postoperative outcomes in clinical practice: a two-centre prospective observational trial	BJA 2022; 128(6):959-970	12

Summary

Aim: This dual-centre, prospective, observational study assesses whether the availability of SmartPilot View alters the behaviour of anaesthetic drug titration of anaesthetists and improves the Anaesthesia Quality Score

Design: Dual-centre, prospective, observational study

Institute: Department of Anaesthesiology, University of Groningen, University Medical Center Groningen, Groningen, Netherland; Department of Anaesthesia, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

Subjects: 493 Patients

Method: 493 patients were scheduled for elective surgery in two university centres. A control group (Control; n=170) was enrolled to observe drug titration in current practice. Thereafter, an intervention group was enrolled, for which SmartPilot View was made available to optimise drug titration (SPV; n=188). The AQS, haemodynamic and hypnotic effects, recovery times, pain scores, and other parameters were compared between groups.

Results: There were 358 patients eligible for analysis. Anaesthesia quality score was similar between CONTROL and SPV (median AQS [Q1–Q3]) 25.3% [7.4–41.5%] and 22.2% [8.0–44.4%], respectively; P=0.898). Compared with CONTROL, SPV patients had less severe hypotension and hypertension, less BIS <40, faster tracheal extubation, and lower early postoperative pain scores. Furthermore, slight differences were found with regards to the time between suturing and extubation. In the control group it took 7.2 min (4.3 - 12.6 min) after suturing until extubation and in the SPV group 5.1 min (2.2 - 10 min).

Conclusion: In conclusion, use of SmartPilot View did not result in a significant difference in AQS or a significant shift in drug titration
behaviour of anaesthetists. However, it significantly reduced the severity of hypotension and hypertension during maintenance of anaesthesia and excessive depth of anaesthesia, and it produced small differences in early recovery parameters. These results suggest that some patients benefit from the use of SmartPilot View without increases in adverse events and without increasing perceived anaesthetist workload.

Study

Evidence level	Author	Title	Publication	Page
II	von Dincklage F et al.	Utility of Nociceptive Flexion Reflex Threshold, Bispectral Index, Composite Variability Index and Noxious Stimulation Response Index as measures for nociception during general anaesthesia	Association of Anaesthetists 2012; 67(8): 815-936	7

Summary

Aim: The aim of this study is to investigate the usefulness of different measures of nociception for their ability to predict movement and heart rate responses after laryngeal mask insertion (LMA) and skin incision

Design: Observational study

Institute: Clinic for Anaesthesiology, Charité – Medical University Berlin, Germany; Associate Professor, Département d'anesthésiologie, Hôpitaux Universitaires de Genève, Genf, Switzerland

Subjects: 50 female patients undergoing breast surgery

Method: The BIS, the Nociceptive Flexion Reflex Threshold (NFRT), the Composite Variability Index (CVI), the NSRI and the calculated propofol/remifentanil effect compartment concentrations (Ce) were analysed. Anaesthesia was induced via TCI pumps with propofol. Remifentail was used to maintain calculated effect-site concentration. Immediately before and during induction of anaesthesia, a tight-fitting face mask was put on and the end-tidal carbon dioxide concentration was kept stable by manual ventilation. After 3 minutes, an LMA was inserted. If the patient moved any part of the body during or 60 seconds after LMA insertion, this was counted as a 'response'. Heart rate responses were calculated as the difference between the maximum heart rate in the 60 seconds prior to LMA insertion and the maximum heart rate up to 60 seconds after insertion, with an increase > 5 / min counted as a 'response'.

Results: The following prediction probabilities for movement reactions were determined during insertion of the laryngeal mask or skin incision : NFRT=0,77 and 0,72; p=0,0001 resp. 0,004; BIS=0,41 and 0,56, p=0,29 resp. 0,5; CVI=0,48 and 0,57, p=0,76 resp. 0,88; **NSRI=0,49 and 0,76**, p=0,92 resp. 0,0001; Propofol-Ce= 0,35 and 0,66, p=0,04 resp.. 0,03; Remifentanil-Ce=0,68 and 0,72, p=0,01 resp. 0,003.
The following values were determined for heart rate reactions: NFRT=0,68 and 0,75, p=0,04 resp. 0,01; BIS=0,37 and 0,59, p=0,15 resp. 0,41; CVI=0,41 and 0,44, p=0,39 resp. 0,37; **NSRI=0,48 and 0,53**, p=0,84 resp. 0,78; Propofol-Ce=0,42 and 0,56, p=0,39 resp. 0,53; Remifentanil-Ce=0,58 and 0,54, p=0,35 resp. 0,73.

Conclusion: The results show that movement reactions after a skin incision can be predicted with the help of NFRT, NSRI or the effect compartment concentrations. The NSRI achieves a comparable accuracy to the NFRT. The movement reactions after the onset of an LMA were more likely to be predicted with the help of the NFRT or the effect compartment concentration of the drug. Only the NFRT was suitable for predicting heart rate responses.

[Study]

Evidence level	Author	Title	Publication	Page
III	Hannivoort LN et al.	Drug interaction models are better predictors of tolerance/response to noxious stimuli compared to individual measured parameters	EJA 2013; 30: 1-2	1

Summary

Aim: This study continues the pursuit of the parameter with the best correlation to the probability of response to noxious stimuli of different intensity. We used data from a previous study by Heyse et al. (Heyse B, Proost JH, Schumacher PM, et al. Anesthesiology 2012;116:311-23.) on the interaction of sevoflurane and remifentanil to compare several parameters.

Design: Randomised, observational study

Institute: University of Groningen, University Medical Center Groningen, Department of Anaesthesiology, Groningen, Niederlande

Subjects: 40 adult patients

Method: 40 adult patients were randomised to receive different combinations of Sevoflurane (Sevo) and Remifentanil (Remi). according to a criss-cross design. After reaching pseudo-steady state, the patients were assessed for tolerance of 'shake and shout' (SAS), tetanic stimulation (TET), insertion of laryngeal mask airway (LMA) and laryngoscopy (LAR). Bispectral index (BIS), state and response entropy (SE, RE), composite variability index (CVI) and surgical pleth index (SPI) were either recorded or computed from raw electroencephalographic and plethysmographic data retrospectively. Sevo and Remi concentrations were recorded. The combined potency of Sevo and Remi according to the fixed $C50_o$ hierarchical interaction model (U) and the noxious stimulation response index (NSRI) were the population-based predictors.

Results: The prediction probability of a response to a stimulus for all stimuli was highest for NSRI and the fixed $C50_o$ hierarchical interaction model. BIS; SE, RE and CVI were significantly worse predictors of tolerance to the painful stimuli.

Conclusion: U and NSRI perform significantly better than EEG-derived parameters and single drug effect site concentrations in predicting tolerance to noxious stimuli. Therefore, both U and NSRI could be useful parameters in anaesthetic practice.

Study

Evidence level	Author	Title	Publication	Page
III	Inan G et al.	Evaluating the role of Smartpilot® view assisted target-controlled infusion anesthesia during intracranial mass surgery: A comparative retrospective study with bispectral index-guided standard anesthesia	J Surg Med 2021; 5(9):884-8	5

Summary

Aim: The goal of this study was to compare the effectiveness of SPV with standard BIS-guided anaesthesia administration in terms of intraoperative hemodynamic stabilization, anaesthetic consumption, and postoperative recovery times during intracranial mass surgery

Design: Retrospective study

Institute: Gazi University School of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey

Subjects: 139 patients (age from 18 to 65 years,) ASA I to III, no kidney or liver illness, underwent TIVA anaesthesia

Method: The records of the patients who underwent elective supratentorial craniotomy between November 15, 2017, and March 15, 2018, were reviewed retrospectively. The demographics of the patients, anaesthesia and surgery times, eye opening and extubation times, time to reach an Aldrete score of 9 and anaesthetic (Propofol and Remifentanil) consumptions were compared between those who were monitored with SPV in addition to BIS (SPV Group) and those who were monitored with solely BIS for standard anaesthetic follow-up (BIS Group). The Noxious Stimulation Response Index was maintained between 0 and 20 for intubation, Mayfield pin placement, skin incision, craniotomy, and dural opening, and between 20 and 50 for the rest of the procedure in the SPV Group. For patients in the BIS Group, a BIS of 40 to 60 was targeted to achieve routine anaesthetic follow-up.

Results: A total of 139 subjects were analysed (SPV (n=71), BIS (n=68)). Hemodynamic responses to induction and intubation were more pronounced in the BIS group (P<0.05). Time until eye opening and extubation were 3.6 (2.4) versus 6.06 (1.63) minutes and 5.76 (1.3) versus 9.16 (1.0) minutes in the SPV and BIS groups (P<0.001). In the SPV Group, it took much less time to achieve an Aldrete score of 9 or above (P<0.001). Total consumed amount of both propofol and remifentanil were significantly lower in the SPV group (P<0.001).

Conclusion: Use of SPV compared to BIS-guided routine anaesthesia follow-up improved titration and consumption of anaesthetic drugs, thereby facilitating the early recovery process in patients who underwent intracranial mass surgery.

Study

Evidence level	Author	Title	Publication	Page
III	Inan G, Satirlar Ozkose Z	Target Controlled Infusion via Smartpilot? view for Neuromonitoring in Neurosurgical Patients: A Novel Technology	Clin Surg. 2021; 6: 3165	5

Summary

Aim: In this retrospective research it was aimed to evaluate whether SPV was correlated with optimal anaesthetic agent titration as a decision support in anaesthesia management and to investigate its usefulness and efficacy on intraoperative hemodynamic stabilisation and attainment of neuromonitoring signals.

Design: Retrospective research

Institute: Department of Anesthesiology and Reanimation, Gazi University, Ankara, Turkey

Subjects: 43 patients (age from 25 to 38 years,) ASA I to III, underwent neurosurgery with INM

Method: Patients underwent neurosurgery with INM between January 1st, 2018 to January 1st, 2019 were retrospectively documented. The subjects were divided into two groups following data scanning: Those monitored with SPV (n=20) and those undergone standard anaesthesia follow-up (n=23). The analysis included hemodynamic parameters, BIS, anaesthesia and surgery times, extubation time, and anaesthesia consumption. For Group SPV, the relationship between hypotensive episodes as well as anaesthesia time spent in each isobole and alterations of neuromonitoring signals was analysed.

Results: Data from 43 patients were included in this analysis (n=20 SPV; 23 control). Both groups had similar demographic data. Extubation time (p=0.013) and total anaesthesia time spent with mean arterial pressure <60 mmHg (p=0.008) was longer in Group Control. Propofol was consumed more in Group Control (p=0.036). There was a linear correlation between anaesthesia time spent with MAP<60 mmHg (p<0.0001), anaesthesia time spent with TOL (tolerance of laryngoscopy) >90 (p=0.0011) and prolongation in latency and decrease in amplitude of neuromonitoring signals.

Conclusion: By reducing intraoperative hypotension time, SPV-guided TCI improved intraoperative hemodynamic and was effective in optimising intravenous anaesthesia without influencing INM signals during neuromonitoring.

Study

Evidence level	Author	Title	Publication	Page
III	Inan G et al.	The Effect of Smartpilot® View, A New Decision Support System on Recovery and Anesthetic Consumption in Spinal Surgery: A Retrospective Study	JARSS 2021; 29(4):226-32	7

Summary

Aim: In this retrospective study, it was aimed to compare effects of SPV-guided general anaesthesia and BIS-guided standard anaesthesia on recovery times and anaesthetic consumption in patients who had undergone spinal surgery.

Design: Retrospective study

Institute: Gazi University School of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey

Subjects: 120 adult patients, ASA I to III

Method: Records of the patients who underwent elective spinal surgery between November 2017-February 2018 were reviewed retrospectively. As a result of data scanning, patients were divided into two groups: SPV-guided (SPV) and BIS-guided standard anaesthesia (Control). The demographics of the patients, anaesthesia and surgery times, eye opening and extubation times, and amount of anaesthetic drug consumed were compared between the two groups.
In the SPV group, the NSRI target range was set as NSRI <20 for intubation and incision and NSRI 20-50 for the rest of the procedure

Results: Totally 120 subjects were analysed (SPV n=63, control n=57). Time taken for eye opening and extubation were 134.27±28.83 sec and 296.89±35.28 sec, 188.67±42.01 sec and 339.23±51.37 sec in SPV and control groups, respectively and both durations were significantly shorter in SPV group ($p<0.001$). End-tidal sevoflurane concentrations during maintenance of anaesthesia were significantly lower in SPV group ($p<0.05$). Total remifentanil consumption was also significantly reduced in SPV group ($p<0.001$). No side effects were observed.

Conclusion: By enabling for precise anaesthetic titration during spinal surgery, SPV as a decision support device potentially improved intraoperative decision-making, enabled faster recovery and reduced anaesthetic consumption.

[Study]

Evidence level	Author	Title	Publication	Page
V	Mai S et al.	Complementary Use of Effect Site-Target Controlled Infusion and SmartPilot View for Anesthetic Management in Semi-awake Craniotomy Near BIS 85	J Neurosurg Anesthesiol. 2018; 30(1):78-79	1

Summary

Aim: It is being investigated how SmartPilot View (SPV) can help to achieve a low but sufficient depth of anaesthesia during an awake craniotomy .

Design: Case report

Institute: Department of Anesthesiology and Intensive Care Asahikawa Medical University Asahikawa, Hokkaido, Japan

Subjects: Male patient ca.60 years old (162cm, 52kg)

Method: During a semi-awake craniotomy, data from the SPV is used to control the dosage of anaesthetics and maintain a semi-awake state with target value of BIS 85

Results: The patient had no memory of the operation and no complaints in the postoperative interview. Level of sedation was comparable to ‘moderate’ as defined in the "Practice guidelines for sedation and analgesia by non-anesthesiologists" (Gross JB, Bailey PL, Connis RT, et al. Anesthesiology. 2002; 96:1004–1017.)

Conclusion: The indication of the depth of anaesthesia by SPV successfully facilitated the stable maintenance of the semi-awake state.

Study

Evidence level	Author	Title	Publication	Page
V	Struys MMRF et al.	Optimizing intravenous drug administration by applying pharmacokinetic/pharmacodynamic concepts	BJA 2011; 107(1): 38–47	10

Summary

Aim: This article discusses how anaesthetists can optimise the administration of anaesthetics and analgesics by using pharmacokinetic and pharmacodynamic information.

Design: Overview article

Institute: Department of Anesthesiology, University Medical Center Groningen, University of Groningen, Groningen, Netherland, Department of Anaesthesia, Ghent University, Gent, Belgium

Subjects: /

Method: The article considers the dose-response relationship and interaction of intravenous hypnotics and opioids and examines various commercially available systems based on pharmacokinetic (PK) and pharmacodynamic (PD) models, such as SmartPilot View and Navigator, for modelling the depth of anaesthesia.

Results: The inclusion of PK/PD models as additional input to control anaesthesia enables optimised, patient-specific anaesthesia and can lead to better patient care. However, these models are only applicable for adults.

Conclusion: By using PK/PD-based information, anaesthetists are able to optimise the administration of anaesthetics and analgesics.

Study

Evidence level	Type of scientific publication / Description
I	• High-quality randomized controlled trial with statistically significant difference or no statistically significant difference but narrow confidence intervals • Systematic review of Level-I randomized controlled trials (and study results were homogeneous)
II	• Lesser-quality randomized controlled trial (e.g., <80% follow-up, no blinding, or improper randomization) • Prospective comparative study • Systematic review of Level-II studies or Level-I studies with inconsistent results
III	• Case-control study • Retrospective comparative study • Systematic review of Level-III studies
IV	• Case series
V	• Expert opinion