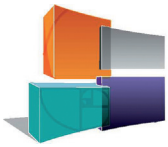
Anaesth Crit Care Pain Med 37 (2018) 239–244



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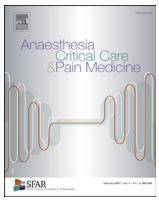

Original Article

Spinal anaesthesia in outpatient and conventional surgery: A point of view from experienced French anaesthetists

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ARTICLE INFO

Article history:
Available online 19 December 2016

Keywords:
Spinal anaesthesia
Outpatient
Local anaesthetics

ABSTRACT

Introduction: The objective of this investigation was to evaluate the practice of spinal anaesthesia among French anaesthetists in inpatient and outpatient settings.
Methods and materials: A questionnaire was sent to members of the French Association of Anaesthetists involved in regional anaesthesia during the first 4 months of 2015. The questionnaire included items on the practice of spinal anaesthesia (type of needle, local anaesthetic available, puncture and disinfection techniques, etc.) and on the anaesthetic techniques usually used in 5 surgical situations eligible for outpatient surgery (knee arthroscopy, inguinal hernia, transobturator tape, haemorrhoids, varicose veins in the lower limbs).
Results: Responses from 703 anaesthesiologists were analysed. Spinal anaesthesia was usually performed in a sitting position (76%) using a Whitacre needle (60%) with a 25 G (57%) diameter. Ultrasound before puncture was reported in 26% of cases due to obesity or spinal abnormalities. Among the 5 surgical situations eligible for outpatient spinal anaesthesia, the technique was typically proposed in 29–49% of cases. Bupivacaine was the most used local anaesthetic. Concerns over delays in attaining readiness for hospital discharge, urine retention, operation length, and surgeon's preference were the main reasons for choosing another anaesthetic technique in these situations.
Discussion: New local anaesthetics are beginning to be used for outpatient spinal anaesthesia due to their interesting pharmacodynamic profile in this context. This study will provide a basis for evaluating future changes in practice.

1. Introduction

Spinal anaesthesia is a reliable technique for regional surgery of the lower half of the body [1]. It can be offered as an anaesthetic technique in outpatient surgery for multiple interventions [2]. In this case, French recommendations emphasize the need to adapt the technique to allow early resumption of autonomy, focusing on low doses, the use of fat-soluble adjuvants and lateralization [3]. Until recently, bupivacaine and ropivacaine were the only local anaesthetics usable in spinal anaesthesia. Their length of action explains in part why spinal anaesthesia has been abandoned by some practitioners in outpatient contexts [4]. The arrival on the market of short-acting local anaesthetics (chloroprocaine, prilocaine) may alleviate certain disadvantages associated with spinal anaesthesia [5], resulting in more frequent use of this technique for the most eligible outpatient interventions. To answer this question, we conducted a descriptive survey of practices. The primary goal was to evaluate the practice of spinal anaesthesia in inpatient and outpatient settings by anaesthetists involved in regional anaesthesia. The second goal was to specifically study the

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http://dx.doi.org/10.1016/j.accpm.2016.12.002

role of spinal anaesthesia in 5 surgical interventions eligible for spinal anaesthesia.

2. Methods

This cohort study was conducted from January 2015 to April 2015. Each participant who responded to the online questionnaire accepted de facto to participate in this study.

The method used was similar to that used in a previous study [6]. A questionnaire developed using an internet platform was sent to 3800 members of the French-speaking Association of Anaesthetists involved in regional anaesthesia via the association's website (www.i-alr.com) as well as via email campaigns. Regular reminders were sent out every month.

The questionnaire was divided into 3 parts. The first part included personal data:

- country;
- type of healthcare facility (private, academic, non-academic, other);
- experience in anaesthesia (< 5 years (resident), 5–15 years, 15–25 years, > 25 years);
- presence of a dedicated outpatient structure in the institution (yes/no);
- the main activity (outpatient, elective surgery, both);
- number of weekly activities (all types) (number of general anaesthesias [GA], number of ALR devices with or without GA, number of single spinal injections with or without associated GA).

The second part of the questionnaire concerned how spinal anaesthesia was performed:

- the type of needle;
- the needle diameter;
- patient position during puncture (sitting, lateral position, varies depending on the intervention, varies depending on the baricity of the local anaesthetic);
- skin disinfectant (alcoholic povidone-iodine, povidone-iodine 4 times, alcohol, chlorhexidine);
- aseptic conditions for the practitioner and the assistant (wearing sterile gloves, face masks, caps, gowns).

The various local anaesthetics available for spinal anaesthesia were recorded. The use of adjuvants (clonidine, sufentanil, fentanyl, morphine, adrenaline), and their frequency and pattern of use were noted. Finally, the usual orientation of the needle bevel during puncture (cephalic, caudal, the side to be anesthetized, unimportant) and the use of ultrasound (frequency and specific situations) were considered.

The last three questions concerned the practice of spinal anaesthesia as an outpatient procedure. The first question concerned the type and time of analgesic administration (premedication, infiltrations, systematically intravenous during surgery or in the recovery room, systematically oral before the spinal anaesthesia wears off, systematically oral upon arrival at the outpatient clinic). The second question concerned pain management as the spinal anaesthesia wears off: morphine titration immediately in the recovery room (is outpatient care possible or not?), PACU morphine titration as a last resort (and effects on same-day release). Finally, the third question concerned the risk management of urinary retention during discharge from ambulatory care: simple patient information, mandatory urination before discharge for all patients or only patients at risk, systematic bladder ultrasound for all patients or only patients at risk.

The third part of the questionnaire concerned 5 surgical situations eligible for spinal anaesthesia and outpatient care (knee arthroscopy, inguinal hernia, Transobturator tape (TOT) for treatment of stress urinary incontinence, haemorrhoid surgery, and varicose veins in the lower limbs). The same questions, except for those pertaining to the anaesthetic technique, were asked for the 5 situations:

- procedure performed in the establishment;
- the usual type of hospitalization (hospitalization, outpatient care);
- the usual technique for anaesthesia;
- main reasons for using a different form of anaesthesia (duration of the operation, surgeon preference, anaesthetist's choice, length of time till the patient can safely be discharged, postoperative pain, postoperative nausea and/or vomiting, urinary retention, postoperative headache, extended patient preparation for intervention, other);
- description of spinal anaesthesia technique (type of local anaesthetic, adjuvants, patient position during the puncture).

Data are expressed as numbers (percentages) or medians [interquartile range]. Results were compared according to the type of healthcare facility. Chi-square tests for qualitative variables or Kruskall-Wallis tests for quantitative variables with Bonferroni corrections for repeated measures were used. To improve the clarity of the manuscript, we decided to combine the data from all the healthcare facilities. A P-value < 0.05 was considered significant. All statistical analyses were performed using StatView 5.0 (SAS Institute Inc., Cary, NC), Tanagra 1.4.27 (Rakotomalala, Lyon, France) and R 2.14.1 (R Foundation, Vienna, Austria) software.

3. Results

During the study period, 1035 French-speaking anaesthetists participated in this study. Seven hundred and three questionnaires were analysed.

Regarding demographics (Table 1), anaesthesiologists who responded worked primarily in non-academic and private institutions and more than half of them had more than 15 years of experience in anaesthesia. No significant differences were found

Table 1
Healthcare facility, experience in anaesthesia and practice of regional anaesthesia.

Healthcare facility	
Teaching hospital	158 (22)
Private hospital	256 (37)
Non-teaching hospital	231 (33)
Other	58 (8)
Experience in anaesthesia	
< 5 yrs (resident)	42 (6)
5–15 yrs	249 (35)
15–25 yrs	169 (24)
> 25 yrs	243 (35)
Service dedicated to ambulatory	
Yes/no	648 (92)/55 (8)
Main activity	
Traditional surgery	83 (12)
Ambulatory surgery	23 (3)
Both indifferently	597 (85)
Weekly activity: GA/PNB/SA	
None	1 (0.5)/21 (3)/13 (2)
1–5	13 (1.5)/78 (11)/339 (48)
6–10	48 (7)/170 (24)/235 (33.5)
11–50	511 (73)/402 (57)/113 (16)
> 50	130 (18)/32 (5)/3 (0.5)

Data are expressed as numbers (%). GA: general anaesthesia; PNB: peripheral nerve block (alone or associated with GA); SA: spinal anaesthesia (alone or associated with GA).

among healthcare facility types. A structure dedicated to ambulatory care was present in 92% of cases, and the majority of respondents worked in a mixed structure. Approximately 83% of anaesthetists performed fewer than 10 spinal anaesthesia operations per week.

Spinal anaesthesia was mainly performed with 25 G (57%) diameter Whitacre needles (60%) in a sitting position (76%) (Table 2). Several needle models were available in 82% of cases. Skin disinfection was carried out using alcoholic povidone-iodine (55%) or non-alcoholic povidone-iodine (40%). The operator wore a mask, sterile gloves and cap in 85% of cases, and the operating aid at the time of the procedure wore a mask and a cap in 75% of cases. The bevel of the needle was preferentially cephalic oriented (62%). Ultrasound was not used in 61% of cases, for certain specific situations in 26% of cases (spine abnormalities [73%], obesity [70%], failed first attempts [13%], elderly patients [3%]). The local anaesthetic drug used was predominantly bupivacaïne. Among adjuvant drugs, sufentanil and morphine were the most frequently used (Table 3).

For surgery performed in ambulatory care settings, analgesia was primarily achieved intravenously during surgery or in the recovery room (Table 4). Wound infiltration techniques and intra-articular injections were also frequent. In the event of pain during spinal anaesthesia, morphine titration after failure of other analgesics was the technique the most often proposed in the recovery room, without being detrimental to patient discharge from the institution (Table 4). The majority of anaesthesiologists require mandatory urination from all patients before they are discharged from ambulatory care.

For the 5 surgical situations eligible for ambulatory care, spinal anaesthesia was the technique usually used in 29 to 49% of cases (Table 5). For knee arthroscopy (94% of cases are outpatient), spinal anaesthesia was proposed in 45% of cases, most often with hyperbaric bupivacaine (65% of cases). Chloroprocaine (21%) and prilocaine (3%) were rarely used. The main reasons for choosing an anaesthetic technique other than spinal anaesthesia were the duration of the operation, the fear of a delay in patient readiness for discharge and the fear of urinary retention. As concerns surgery for varicose veins in the lower limbs (95% outpatient), spinal anaesthesia was proposed in 49% of cases, essentially using hyperbaric bupivacaine (79% of cases), followed by isobaric bupivacaine (7%) and chloroprocaine (7.5%). Twenty nine per cent of inguinal hernias operated on in outpatient care (87% of cases) received spinal anaesthesia with bupivacaine (91.5%), prilocaine (1%) or chloroprocaine (5.5%). The main reasons for choosing another technique in outpatient care included fear of urinary retention and the surgeon's preference. Surgery for urinary incontinence via the TOT method (60% outpatient) was performed

Table 2
Details of the spinal anaesthesia technique.

Type of spinal needle	
Whitacre	421 (60)
Sprotte	112 (16)
Quincke	55 (8)
Atraucan	10 (1)
Unknown	105 (15)
Preferential size of the needle (G)[a]	
21–23	21 (3)
24	51 (7)
25	391 (57)
26	47 (7)
27	170 (24.5)
28–29	11 (1.5)
Usual patient position for puncture	
Sitting	536 (76)
Lateral decubitus	28 (4)
According to surgery	50 (7)
According to baricity	6 (1)
Multiple choice or missing	83 (12)
Skin disinfection[b]	
Alcoholic povidone	389 (55)
Non-alcoholic povidone	281 (40)
Alcohol	0
Chlorhexidine	32 (5)
Operator protection[c]	
Standard	595 (85)
< Standard	6 (0.5)
> Standard	97 (14)
Missing	5 (0.5)
Caregiver protection[d]	
Standard	527 (75)
< Standard	16 (2)
> Standard	90 (13)
Missing	70 (10)
Needle tip position	
Cephalic	433 (62)
Caudal	38 (5)
Side to be anesthetized	93 (13)
Indifferent	139 (20)
Pre-procedural ultrasound scan	
Never	426 (61)
Sometimes	82 (12)
Systematically	9 (1)
In specific conditions	186 (26)

Data are expressed as numbers (%). G: gauge.
[a] Missing data: 12.
[b] Missing data: 1.
[c] Standard protection for operator: sterile gloves, cap and mask.
[d] Standard protection for caregivers who assisted the operator: cap and mask.

Table 3
Type of local anaesthetic available and the frequency of association of different adjuvants with local anaesthetics.

Local anaesthetic[a]	
Hyperbaric bupivacaine	642 (91)
Isobaric bupivacaine	269 (38)
Levobupivacaine	105 (15)
Ropivacaine	124 (18)
Hyperbaric prilocaine	97 (14)
Chloroprocaine	252 (36)
Adjuvant combined with local anaesthetic	
Clonidine	
Never	341 (48.5)
Sometimes	249 (35)
Often	32 (4.5)
Systematically	1 (0.5)
Missing	80 (11.5)
Sufentanil	
Never	40 (5.5)
Sometimes	160 (23)
Often	315 (45)
Systematically	176 (25)
Missing	12 (1.5)
Fentanyl	
Never	510 (72.5)
Sometimes	8 (1)
Often	6 (1)
Systematically	2 (0.5)
Missing	177 (25)
Morphine	
Never	74 (10.5)
Sometimes	312 (44)
Often	275 (39)
Systematically	17 (2.5)
Missing	25 (4)
Adrenaline	
Never	535 (76)
Sometimes	11 (1.5)
Often	2 (0.5)
Systematically	1 (0)
Missing	154 (22)

Data are expressed as numbers (%).
[a] Multiple answers available.

Table 4
Management of urinary retention and pain for surgeries performed under spinal anaesthesia as an outpatient.

Usually prescribed analgesic ($n = 632$)	
Analgesic premedication	100 (16)
Wound or intra-articular infiltration	286 (45)
Systematic IV during surgery	268 (42)
Systematic IV in the recovery room	230 (36)
Systematic per bone for outpatient procedures	181 (29)
Systematic per bone as spinal anaesthesia wears off	142 (22)
Pain management when spinal anaesthesia wears off ($n = 620$)	
Morphine titration immediately in the recovery room (discharge on improvement)	105 (17)
Morphine titration immediately in the recovery room (hospitalization)	6 (1)
Morphine titration in recovery room after other analgesics (discharge on improvement)	456 (74)
Morphine titration in recovery room after other analgesics (hospitalization)	53 (8)
Urinary retention risk management before release from ambulatory care ($n = 628$)	
Systematic bladder ultrasound for all patients	27 (4)
Bladder ultrasound for at-risk patients	36 (6)
Basic information on risk without any other measures	61 (10)
Mandatory urination before exit routine for all patients	371 (59)
Mandatory urination before discharge, only for at-risk patients	133 (21)

Data are expressed as numbers (%).

Table 5
Anaesthetic technique for the 5 surgical situations eligible for outpatient care and spinal anaesthesia. Data are expressed as numbers (%).

	Knee arthroscopy ($n = 611$)[a]	Inguinal hernia ($n = 607$)[a]	Transobturator tape ($n = 549$)[a]	Haemorrhoid treatment ($n = 456$)[a]	Varicose lower limbs ($n = 463$)[a]
Hospitalisation mode					
Outpatient	577 (94)	531 (87)	331 (60)	225 (49)	438 (95)
Hospitalisation	34 (6)	76 (13)	218 (40)	231 (51)	25 (5)
Ambulatory anaesth. technique					
GA ± joint infiltration	285 (49.5)	327 (61.5)	177 (53)	128 (57)	199 (45)
Regional anaesthesia ± sedation	24 (4)	38 (7)	5 (2)	12 (5)	21 (5)
Local anaesthesia ± sedation	6 (1)	9 (1.5)	0	1 (0.5)	0
Spinal anaesthesia ± infiltration	259 (45)	153 (29)	149 (45)	84 (37)	213 (49)
Missing	3 (0.5)	4 (1)	0	1 (0.5)	5 (1)
Anesth. technique hospitalisation					
GA ± joint infiltration	17 (50)	53 (70)	108 (49.5)	126 (54.5)	10 (40)
Regional anaesthesia	4 (12)	1 (1)	0	12 (5)	0
Local anaesthesia ± sedation	0	0	0	1 (0.5)	0
Spinal anaesthesia ± infiltration	12 (35)	21 (28)	110 (50.5)	91 (39.5)	15 (60)
Missing	1 (3)	1 (1)	0	1 (0.5)	0
Local anaesthetic if spinal in ambu	($n = 259$)	($n = 153$)	($n = 149$)	($n = 84$)	($n = 213$)
Hyperbaric bupivacaine	168 (65)	126 (82.5)	96 (64)	63 (75)	169 (79)
Isobaric bupivacaine	20 (8)	14 (9)	10 (6.5)	7 (8.5)	15 (7)
Ropivacaine	3 (1)	0	4 (3)	0	3 (1.5)
Prilocaine	9 (3)	2 (1)	5 (3.5)	3 (3.5)	7 (3.5)
Chloroprocaine	54 (21)	8 (5.5)	31 (21)	10 (12)	16 (7.5)
Missing	5 (2)	3 (2)	3 (2)	1 (1)	3 (1.5)
Reasons for no spinal in ambu[b]	($n = 310$)	($n = 361$)	($n = 174$)	($n = 134$)	($n = 211$)
Concerns over urinary retention	146 (47)	169 (47)	51 (29)	55 (41)	68 (32)
Headache concerns	36 (12)	32 (9)	21 (12)	11 (8)	23 (11)
Fear of lengthening preparation time	38 (12)	24 (7)	10 (5.5)	12 (9)	19 (9)
Concerns over patient readiness for discharge	138 (45)	105 (29)	50 (28.5)	29 (22)	62 (29)
Operation length	132 (43)	107 (30)	81 (46.5)	37 (28)	66 (31)
Surgeon preference	87 (28)	157 (43)	72 (41)	58 (43)	94 (45)
Anaesthesiologist preference	67 (22)	104 (29)	41 (23.5)	42 (31)	64 (30)
PONV concerns	3 (1)	3 (1)	2 (1)	1 (1)	2 (1)
Pain concerns	5 (2)	12 (3)	3 (2)	8 (6)	1 (0.5)
Other (patient refusal, etc.)	50 (16)	78 (22)	29 (16.5)	28 (21)	27 (13)

[a] n: number of anaesthesiologists performing this surgery in their centre who responded to the questionnaire.
[b] Multiple responses are possible from those who perform this surgery as an outpatient procedure using a technique other than spinal anaesthesia.

under spinal anaesthesia in 45% of cases, mainly with bupivacaine (70.5%), followed by chloroprocaine (21%) and prilocaine (3.5%). The reasons for choosing another technique included duration of surgery, the surgeon's preference, concerns about urinary retention and patient readiness for discharge. Finally, for the treatment of haemorrhoids (49% outpatient), spinal anaesthesia was proposed in 37% of outpatient cases, mainly using bupivacaine (83.5%), followed by prilocaine (3.5%) and chloroprocaine (12%). The reasons put forward for choosing another technique mainly included surgeon preference, as well as concerns about urinary retention.

4. Discussion

This study of practices sheds light on the use of spinal anaesthesia by more than 700 experienced French practitioners, particularly in the context of ambulatory surgery. Moreover, this is, to our knowledge, one of the first studies looking at the role of new

local anaesthetics with marketing authorization for spinal anaesthesia. This study will serve in the future as a basis for monitoring the development of practices in spinal anaesthesia and ambulatory care.

Spinal anaesthesia remains one of the most common regional anaesthesia techniques. The present study added new insights concerning the practice of this regional technique. Typically, spinal anaesthesia was performed with a 25G (or 27G) Whitacre needle, while sitting, with hyperbaric bupivacaine, thus confirming the results of previous studies [7], and associated with sufentanil in 70% of cases. It is interesting to note that the rules for asepsis issued in the recommendations for clinical practice of the French Society for Anaesthesia and Intensive Care (Sfar) are well respected [8]. Having the operator and caregivers involved in the procedure wear face masks is a way of preventing the risk of oral transmission of germs on contact with the meninges, as has been described in the literature [9]. While alcoholic chlorhexidine is more effective than alcoholic povidone-iodine for preventing infections during the placement of intravascular catheters [10], it is rarely used in the context of spinal anaesthesia. The risk of neurological complications due to chlorhexidine used in spinal contexts probably explains the low frequency of use of this particular disinfectant. However, this risk seems largely overrated [11].

Systematic ultrasound before puncture is rarely used (Table 2). These results are similar to those of a survey conducted on the use of ultrasound during regional anaesthesia in a similar population [6]. Although the literature data are in favour of using ultrasound to facilitate the identification of the appropriate level and subsequently reduce the number of punctures and to predict potential puncture and needle direction problems [12,13], only a quarter of respondents use it in specific situations (obesity, elderly patients, etc.). A common or even systematic ultrasound practice for every spinal anaesthesia procedure should be encouraged to acquire the expertise needed to optimize the use of ultrasound in difficult circumstances.

Hyperbaric bupivacaine is the local anaesthetic most commonly used by almost all anaesthesiologists who responded to this survey (Table 3). The frequency with which it is combined with lipid-soluble morphine should be highlighted. This practice is especially recommended in situations where low blood pressure should be avoided and consequently, lower doses of local anaesthetic are needed [14]. This is particularly the case for spinal anaesthesia in obstetrics [8].

The pharmacological properties of new local anaesthetics, especially in terms of block duration (and therefore the risk of urinary retention), support their promotion, particularly in ambulatory surgery [5]. Despite only recently becoming available, such new local anaesthetics are available in 14–36% of cases (Table 3), which shows some interest on the part of anaesthesiologists. This point deserves to be reassessed over time.

In the proposed five surgical situations, spinal anaesthesia is used only in 29 to 49% of outpatient cases (Table 5). It is accepted that spinal anaesthesia can affect outpatient hospital stays, compared with general anaesthesia and peripheral regional anaesthesia [15]. Therefore, the use of spinal anaesthesia as a technique in certain surgical indications performed in ambulatory surgery has decreased over time [4]. Apart from the surgeon's preference, other reasons given are closely linked to the local anaesthetic used (product and dose), more than to a fear of the technology itself. Indeed, the fear of postspinal anaesthesia headaches and pain when the block wears off were rarely mentioned in our study. However, the risk of urinary retention, concern over a delay in patient readiness for discharge and the short duration of surgery were highlighted most often to explain this choice. Under these conditions, bupivacaine used at usual doses is not the local anaesthetic of choice. Low doses of bupivacaine have been used as an alternative to lidocaine for outpatient procedures [16]. Authors and practitioners frequently reported a wide variety of recovery profiles for spinal bupivacaine (greater than 300 minutes), which renders bupivacaine unpredictable, and as such, not suitable for outpatient anaesthesia. The failure rate reported for low doses, combined with the erratic discharge time of higher doses, makes bupivacaine a less desirable choice for such patients [4]. A recent study comparing 5 and 12.5 mg of hyperbaric bupivacaine for unilateral spinal blocks in patients undergoing knee arthroscopy corroborated earlier findings [17].

The new local anaesthetics have pharmacological properties more suitable for ambulatory surgery. Chloroprocaine is a short-duration local anaesthetic, and prilocaine is an intermediate-duration local anaesthetic [18]. Compared to bupivacaine, chloroprocaine enables earlier release from the ambulatory centre [19]. These advantages were found even when the doses of bupivacaine were reduced, as well as for chloroprocaine [20] and prilocaine [21].

Practitioners offering spinal anaesthesia in an ambulatory context use oral as well as intravenous analgesia. Combining that with sedation or general anaesthesia can justify intravenous administration. However, for patients operated on under spinal anaesthesia alone, the oral administration of the usual analgesics (except morphine) should be encouraged (doing so reduces risks associated with parenteral drug administration, as well as the cost of drugs). For the majority of responders, the use of morphine titration to treat severe pain is not counter-indicated by patient discharge as an outpatient. However, the majority of anaesthesiologists call for spontaneous urination before authorizing the discharge of patients. As an alternative in the absence of risk factors, the recommendations of the Sfar regarding ambulatory care proposed clinical evaluation or, at best, the use of ultrasound techniques [3]. This last point is marginal in our study (Table 4).

The limits of this investigation are well known and associated with the methodology. They were also discussed in the previous survey [6]. It is important to remember that any healthcare professional can be a member of i-ALR, but the practice of spinal anaesthesia is reserved for anaesthetic doctors. Since the percentage of doctors was impossible to determine, it did not seem appropriate to us to calculate the response rate. Moreover, only anaesthetists involved in regional anaesthesia techniques participated in the study. This represents a small proportion of all anaesthetists practicing in France. However, over 700 responses from experienced anaesthetists do provide some idea of current practices. This work will provide a basis for assessing future changes in practice.

5. Conclusion

Spinal anaesthesia seems quite well codified today. Bupivacaine is the local anaesthetic most used in this technique. New local anaesthetics are starting to be used. Their pharmacological properties should allow them to be used more often in the future, especially for ambulatory-eligible surgeries.

Funding

No funding was received to conduct the study or draft the paper.

Disclosure of interest

During the study period, the i-ALR association, presided by R.F., had a partnership with the following companies involved in

regional anaesthesia: Baxter, B-Braun, BK-Medical, Gamida, General-Electric Healthcare, Nordic Pharma, Sonosite, Teleflex, Temena, Vygon. C.A. is a member of the board of NordicPharma and received honoraria for lectures from Abbvie and NordicPharma. P.Z. is consultant for NordicPharma. O.C. is a member of the board of NordicPharma. H.B. has declared partnership with BBraun and Gamida.

Acknowledgments

The manuscript has been revised for English by an independent scientific language editing service.

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