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ORIGINAL ARTICLE

European countries have different rates of sperm cryopreservation before vasectomy and at the time of reversal

Amandine Degraeve[1] | Thierry Roumeguere[2] | Gilles Tilmans[3] | Marie-Laura Marotta[4] | Eric Huyghe[5,6,7] | Georges Fournier[8] | Antoine Faix[9] | Anne-Françoise Spinoit[10] | Karel Decaestecker[10] | François Herve[10,11] | Florence Boitrelle[12,13] | Kanerva Lahdensuo[14] | Julien Van damme[1] | On behalf of the Société Belge d'Urologie (SBU), the Belgische Vereniging voor Urologen (BVU), the Association Française d'Urologie (AFU), the Nederlandse Vereniging voor Urologie (NVU), the Société d'Andrologie de Langue Française (SALF), the Finnish Urological Society (FUS).[1]

[1]Department of Urology, Centre Hospitalier Universitaire, Université Catholique de Louvain, Namur, Belgium

[2]Department of Urology, University Clinics Brussels, Erasme Hospital, Université Libre de Bruxelles, Brussels, Belgium

[3]Unit of Abdominal Surgery, Saint-Luc University Clinics, Université Catholique de Louvain, Brussels, Belgium

[4]Department of Andrology, Centre Hospitalier Universitaire, Université Catholique de Louvain, Namur, Belgium

[5]Department of Urology – Kidney transplantation – Andrology – Rangueil Hopital, Centre Hospitalier Universitaire de Toulouse, Toulouse, France

[6]Department of Reproductive Medicine, Paule de Viguier Hospital, Centre Hospitalier Universitaire de Toulouse, Toulouse, France

[7]UMR 1203, DEFE (Development – Embryo – Fertility – Environment), INSERM, Université de Toulouse – Université de Montpellier, Toulouse, France

[8]Department of Urology, University of Brest, Brest, France

[9]Department of Urology, Clinique Beau Soleil, Montpellier, France

[10]Department of Urology, Ghent University Hopsital, Ghent, Belgium

[11]Department of Urology, Cliniques Universitaires Saint-Luc, Bruxelles, Belgium

[12]Reproductive Biology, Fertility Preservation, Andrology, CECOS, Poissy Hospital, Poissy, France

[13]UVSQ, INRAE, BREED, Paris Saclay University, Jouy-en-Josas, France

[14]Department of Urology and Research Program in Systems Oncology, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

Correspondence
Degraeve Amandine, CHU UCL Namur, Rue Gaston Therasse, 1 5530 Yvoir +32 81 42 34 71, Namur, Belgium.
Email:
amandine.degraeve@student.uclouvain.be

Abstract

Introduction: Effective male contraceptive options are condoms and vasectomy. Vasectomy should not be considered a reversible method of contraception even if vasovasostomy can be offered to men to restore fertility after vasectomy. Therefore, there is a real questioning among urologists concerning cryopreservation before vasectomy. We carried out an international survey concerning the practice of cryopreservation before vasectomy and during vasovasostomy.

Material and methods: An online anonymous survey was submitted from January to June 2021 to six European urological societies. The 31-items questionnaire included

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questions about demography, habits of cryopreservation before vasectomy or during vasectomy reversal, and in case of urogenital cancers.

Results: 228 urologists from six urological societies in five different countries (Belgium, Netherlands, Luxembourg, France, Finland) answered the questionnaire. French urologists were more in favor of cryopreservation before vasectomy than other European urologists ($p < 0.0001$). They also significantly found that not talking about cryopreservation before vasectomy is a medical fault unlike other urologists ($p < 0.0001$). The specialization in andrology did not influence the choice of cryopreservation before vasectomy ($p = 0.9452$). The majority of urologists did not perform intraoperative sperm extraction during vasovasostomy (81%; $n = 127$) with a significant difference between urologists with or without andrology training ($p = 0.0146$). Success rates after vasovasostomy are significantly better for robot-assisted surgery ($p = 0.0159$) or with a microscope ($p = 0.0456$) versus without a microscope.

Conclusion: Cryopreservation before definitive sterilization significantly varies among European urologists and seems to be mostly dictated by habits than by knowledge. An international consensus is needed to standardize practices and guide patients' choices.

KEYWORDS
cryopreservation, definitive sterilization, male contraception, vasectomy, vasectomy reversal

1 | INTRODUCTION

Although female contraceptives are very effective to prevent unintended pregnancy, there is a great need to involve males in the contraception process. At present, the most effective male contraceptive options are condoms and vasectomy. Thermal or hormonal methods are not yet recognized.[1]

Vasectomy is the main surgical procedure for male contraception and consists of cutting and ligating vas deferens. It can be performed under local anesthesia, during the ambulatory hospital stay and is highly effective with a failure rate under 1% with a low rate of complications (10%–15% of men will experience chronic testicular discomfort).[1] This leads to no change in the quality of sexual life. Ejaculation from men may play an important psychological and physical role for both partners during sexual intercourse. Men might be afraid about anejaculation after vasectomy. However, vasectomy does not affect the volume of the ejaculate because spermatozoa represent less than 3% of the semen discharge. Vasectomies do not offer immediate protection against pregnancy. Alternative method contraception is to use for at least three months after the procedure.[2]

Vasectomy has no influence either on the quality of the erection or on the libido. During the preoperative consultation, the stability of the relationship, the age of the children, and each partners' desire for future children should be assessed. Relative contraindications of vasectomy may be the absence of children, young age (< 30 years), severe illness, no current relationship, and scrotal pain.[3]

There is only 3%–5% of men who request a vasectomy reversal (VR) after definitive sterilization because of new partners, loss of a child or to treat chronic testicular pain after vasectomy.[4,5]

The pregnancy rate after VR varies from 50%–75% depending on the length of time between the vasectomy and the vasovasostomy and the surgeon's experience.[6] There are two reasons for procedural failure. First, because of the impossibility to restore patency of the vas, (especially more than 8 years after vasectomy). Second, about 20%–30% of men remain infertile despite patency of the vas due to the presence of anti-sperm antibodies.[7] A high preoperative follicle-stimulating hormone (FSH) value predicts a lower paternity rate after VR and a higher need for assisted reproduction to achieve pregnancy.[8]

The European (EAU) and American (AUA) guidelines have clear recommendations about cryopreservation before vasectomy or during vasovasostomy. On one hand, vasectomy is recommended as a definitive sterilization method, and thus banking spermatozoa before the surgery seems to be opposed. On the other hand, vasectomy should not be considered a valid reversible method of contraception in case of fertility reversal requests.

A definitive or reversal procedure remains unclear about vasectomy. This leads to a different approach among urologists to consider sperm cryopreservation.

The aim of this survey was to study the clinical routine practice of cryopreservation by European urologists before vasectomy and during vasovasostomy. The primary endpoint was to determine the clinical routine practice of cryopreservation by urologists before vasectomy and during vasovasostomy depending on the country.

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The secondary endpoint was to evaluate the impact of andrology training in clinical practice among urologists trained or not in andrology.

2 | MATERIAL AND METHODS

From January to June 2021, we offered to participate in an online anonymous survey to European urological societies from 12 countries: Ireland, UK, Sweden, Finland, Denmark, Netherlands, Belgium, France, Spain, Portugal, Italy, and Germany. Six of them accepted to submit the survey to their members by e-mail: The Société Belge d'Urologie (SBU), Belgische Vereniging voor Urologen (BVU), the Association Française d'Urologie (AFU), the Société d'Andrologie de Langue Française (SALF), the Nederlandse Vereniging voor Urologie (NVU), and the Finnish Urological Society (FUS).

The 31-items questionnaire included seven demographic questions about urologists: country, region, age, status, gender, sub-specialty, and type of center. There were five questions about cryopreservation and vasectomy: number/year, discussion of cryopreservation, opinion about cryopreservation, reasons for cryopreservation, and medicolegal aspects. There were five questions about cryopreservation during VR: number/year, surgical approach, intraoperative sperm extraction, success rate, and follow-up. It included 14 questions about urogenital cancers (testicular, prostate, and bladder cancer) and fertility preservation. The whole questionnaire can be found in the supplementary material appendix. The section concerning cryopreservation and urogenital cancers will be discussed in an upcoming article.

2.1 | Statistical analysis

Statistical analyses were performed using SPSS software version 25 (SPSS Corp., Somers, New York). The p-value < 0.05 was considered statistically significant. Binary variables were expressed as count and proportion. Comparison of parameters between countries was made using the Pearson's chi-squared test, Fisher's exact test, and Binomial test when possible. A comparison between urologists with or without andrological training was made using only Pearson's chi-squared test. VR surgical approaches and success rate were evaluated with Pearson's chi-squared test, Wilcoxon/Kruskal-Wallis test, and Steel Dwass test.

3 | RESULTS

3.1 | Population

Two hundred and twenty-eight urologists from five countries responded to the survey: France (58.3%; $n = 133$), Belgium (29.4%; $n = 67$), The Netherlands (6.6%; $n = 15$), Luxembourg (3%; $n = 7$), Finland (2.6%; $n = 6$). The median age of the population was 47 years (28–86). More than 80% were men (83.5%; $n = 193$). Fifteen percent ($n = 35$) worked in a University Hospital, 34% in a public center ($n = 79$), and 48% in a private center ($n = 111$). Fourteen percent were specialized in andrology ($n = 32$: 22 from France, five from Belgium, and five from the Netherlands).

3.2 | Vasectomy

There are more vasectomies performed per year by urologists in the Netherlands than in other European countries according to our results (Table 1).

The cryopreservation before vasectomy is significantly more discussed in France than in other European countries ($p < 0.0001$): 95% in France, half in Belgium and Luxembourg, and none in Finland or the Netherlands. (Table 2)

French urologists were significantly more in favor of cryopreservation before vasectomy than other European urologists (84% versus maximum 25%; $p < 0.0001$).

Two-thirds of French urologists considered that not talking about cryopreservation before vasectomy is medical malpractice. Those results significantly differed ($p < 0.0001$) from the other European countries. (Table 2)

Urologists with specific training in andrology did not significantly talk more about cryopreservation with their patients than other urologists ($p = 0.9452$). They were not particularly in favor of cryopreservation before vasectomy ($p = 0.0637$) and did not find that not talking about is a medical fault ($p = 0.4782$). (Table 2)

Three-quarters of responders ($n = 171$) considered vasectomy as a definitive procedure. Two-thirds of them took this argument to justify sperm banking before vasectomy. One-third of them took the same argument to justify not cryopreserve.

3.3 | Vasectomy reversal

On average, urologists from the Netherlands performed more vasovasostomies than in other countries which represent 6.8% of vasectomies performed per year (Table 1). Seventy percent ($n = 65$), 20% ($n = 19$), and 10% ($n = 10$) of the procedures were performed without any additional assistance, with a microscope, or with a robot-assisted approach, respectively. The success rates after VR (pregnancy rate) were significantly improved with robot-assisted surgery or with microscopic surgery compared to no use of magnification (respectively $p = 0.0159$ and 0.0456). However, there was no significant difference between the robot-assisted approach and microscopic surgery ($p = 0.1492$) (Table 3).

The majority of urologists did not perform intraoperative sperm extraction during VR (81%; $n = 127$). Among those carrying out an extraction, 8% ($n = 13$) performed a testicular biopsy, 5% ($n = 8$) an epididymal puncture, and 5% ($n = 8$) both. The training in andrology influenced significantly the habits of sperm extraction during VR ($p = 0.0146$).

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TABLE 1 Comparison of vasectomy and vasectomy reversal numbers by urologists and by countries

	France	Belgium	Netherlands	Luxembourg	Finland
Vasectomy mean/year	37.74	49.96	62.93	38.1	10.5
Standard deviation	41.39	49.84	80.98	42.57	10.43
Vasectomy median	28 [0–150]	30 [0–250]	20 [0–300]	25 [20–50]	10 [1–30]
Vasovasostomy mean (year)	1.3	2.65	4.27	1.36	0
Standard deviation	3.65	5	8.18	3.67	0
Vasovasostomy median	0 [0–15]	1 [0–20]	0 [0–30]	0 [0–1]	0 [0]
Proportion vasovasostomy /vasectomy	3.4%	5.3%	6.8%	3.5%	0%

TABLE 2 Cryopreservation discussion and consideration of medical malpractice in case of absence

	Cryopreservation discussion before vasectomy	In favor of cryopreservation before vasectomy	No preoperative cryopreservation discussion synonymous with medical malpractice
France			
France	95% ($n = 125$)	84% ($n = 111$)	74% ($n = 98$)
Other European countries			
Belgium	49% ($n = 33$)	25% ($n = 17$)	21% ($n = 14$)
Luxembourg	57% ($n = 4$)	12% ($n = 1$)	43% ($n = 3$)
Finland/the Netherlands		0% ($n = 0$)	
***p*-value France versus other European countries**			
	$p < 0.0001$	$p < 0.0001$	$p < 0.0001$
Andrological practice			
No	71% ($n = 139$)	54% ($n = 106$)	49% ($n = 97$)
Yes	72% ($n = 23$)	72% ($n = 23$)	56% ($n = 18$)
***p*-value Andrological practice No versus Yes**			
	$p = 0.9452$	$p = 0.0637$	$p = 0.4782$

TABLE 3 Surgical approach vasectomy reversal's success rates

	Surgical approach	Mean success rate	Standard Deviation
Surgery with microscope[1]	70% ($n = 65$)	46% of success	25.1
Robot-assisted procedure[2]	10% ($n = 10$)	58% of success	16.1
Surgery without miscroscope[3]	20% ($n = 19$)	30.5% of success	24.1
The difference in surgical approach's success rates	1 vs. 3: $p = 0.0456$ 2 vs. 3: $p = 0.0159$ 1 vs. 2: $p = 0.1492$		

Three-quarters of urologists performed semen analysis 3 months after VR, 4% ($n = 5$) monitored the rate of pregnancies obtained, 18% ($n = 20$) monitored births, and 7% ($n = 10$) only performed a clinical examination. Thirty-nine percent of urologists stated that their VR success rate is below 30%, 38% between 30% and 60%, and 23% more than 60%.

4 | DISCUSSION

EAU and AUA guidelines discuss indications and contraindications for vasectomy, preoperative patient information and counseling, surgical techniques, postoperative care, subsequent semen analysis, complications, and late consequences. Options for fertility after vasectomy

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include VR and sperm retrieval with in vitro fertilization.[3,9] There isn't any information or specific recommendations about cryopreservation in case of sterilization requests.[3,9] There is a lack in the medical literature on convenience sperm cryopreservation in this indication. However, the AFU suggests performing cryopreservation before definitive sterilization in a center of study and conservation of human eggs and spermatozoa (CECOS).[10,11] Therefore, there is a real unmet need to improve recommendations to guide physicians and patient's choices.

Internationally, vasectomy rates are vastly different. Our study shows that on average, urologists from the Netherlands perform more vasectomies than in other European countries. Ten percent of men have benefited from vasectomy in North America and in the majority of European countries (Belgium, Denmark, Switzerland, and Spain). Some countries reach 20% of vasectomized men in their population (Canada, the UK, and the Netherlands).[12] Vasectomy was considered illegal in France until 2001, due to provisions in the Napoleonic Code forbidding "self-mutilation". The number of vasectomies is now rapidly increasing in France but so far, only 1% of men have chosen vasectomy as a definitive sterilization method.[13,14]

From our result, French urologists discuss more cryopreservation before vasectomy than in other countries. The lack of discussion of cryopreservation is also mostly described as being a medical fault in France. First, the reason for this approach is the French legislation that clearly mentions the possibility of freezing spermatozoa before vasectomy.[11] Secondly, this type of contraception is only gradually entering the customs of this country.[12] Thirdly, it exits a unique public network of 22 centers that manage sperm banking in France, the federation of CECOS. It plays an important role to access to fertility preservation. Historically these centers offered free self-preservation for sperm donation.[15] However, only 12% of French men who decided to have a vasectomy consulted a CECOS for sperm cryopreservation before surgery with only 5% using their sperm sample afterward.[10]

Urologists with specific training in andrology did not significantly talk more about cryopreservation with their patients than other urologists ($p = 0.9452$). They were particularly not in favor of cryopreservation before vasectomy ($p = 0.0637$) and did not find that not talking about is a medical fault ($p = 0.4782$). Training in andrology seems not to influence medical practice. It reflects that they are more set up on local habits and customs than on knowledge of the management of fertility and medically assisted procreation. A European consensus is then absolutely needed to standardize care and offer patients from all countries the same guidelines procedure before a vasectomy.

After vasectomy, 2%–6% of men regret having a vasectomy, notably those who underwent it at a young age, those without children of their own, or because of the wish for children in a new relationship.[6,16] The accepted options for fertility after vasectomy include VR and sperm retrieval with in vitro fertilization.[9] These second possibility is expansive but is preferred to VR if female infertility is proven.[9] The VR is generally performed in only 2% of men with vasectomy.[16] For example, after 10 years, 2.4% of vasectomized Dutchmen had a fertilization procedure (mostly VR).[16]

As found in the literature, this survey also illustrates that VR is rarely practiced in Europe with a maximal proportion of 6.8% in the Netherlands.[4,17]

Pregnancy rates after VR will range from 30% to over 90%, depending on the type of procedure, the time between vasectomy and VR, partner age, surgeon experience and training, fertility issue before vasectomy, development of anti-sperm auto-antibodies.[4,17]

In our survey, we demonstrated that the success rates after VR (pregnancy rate) are significantly improved with robot-assisted surgery or with microscopic surgery compared to not using magnification. However, there is no significant difference between the robot-assisted approach and microscopic surgery.

Only 18% of urologists who responded to the survey performed a sperm extraction during the VR. The sperm retrieval with cryopreservation at the time of VR is not cost-effective.[18] In case of VR failure it gives the advantage to have a frozen sperm reserve to avoid a new surgical procedure.[18] This act is mainly carried out by urologists with specific practice in andrology much aware of the question of fertility and management of medically assisted procreation.

Cryopreservation for personal convenience has a financial impact on social security. In Belgium, people can have access to sperm freezing for personal convenience. The maximum storage period is set at 10 years by Belgian law, from the day of freezing and it costs 500 €. At the end of the agreement, an extension of the cryopreservation of spermatozoa may be requested by the patient.[19] In France, frozen semen can be restored for as long as the patient wishes. Since April 17, 2019, the maximum age of use of male gametes has been set at 59 years in France. The annual conservation fees are 40 €/year.[15] The price in the US is 35 $/month, 10 times more than in European countries. The international cryopreservation bank in Denmark offers also the possibility to freeze and store spermatozoa for the rest of the patient's life without an expiration date of 1300 € per sperm sample.[20] Moreover, medically assisted procedures have also non-negligible costs.

Frozen spermatozoa are the best way to avoid auto-antibodies due to inguinoscrotal procedures. Spermatozoa collected during ejaculation have moreover undergone their epididymal sperm maturation and are mobile, insemination is then possible and costs only 200 €.[2] Spermatozoa obtained by testicular biopsy require expansive in vitro fertilization to be used (in Belgium for example 1200 € for oocyte puncture, 300 € for a testicular puncture, 1850 € for in vitro fertilization, and 225 € for embryo transfer).

The main limitation of this study is the participation rates of each country that took part in the survey. Results are mainly provided by French urologists (60%). Only forty percent of invited European urological societies participated in the survey despite several reminders. This participation rate might be explained by the overbooking planning of urologists during COVID time, by the lack of communication between European urological societies, or by the little interest in this subject. A larger-scale study across Europe is needed to validate our results. A patient input could also be very interesting to have more perspectives in this field.

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5 | CONCLUSION

Cryopreservation before definitive sterilization significantly varies among European urologists and seems to be mostly dictated by local habits. An international consensus is needed to standardize practices and guide patients' choices.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTION

AD, JVD, TR, and GT designed the research study.

M-LM, EH, GF, AF, A-FS, KD, FH, FB, KL, SBU, BVU, AFU, NVU, SALF, and FUS forwarded the survey.

AD performed the research, and analyze the data.

AD wrote the paper; JVD, TR, and GT revised critically the paper.

ORCID

Amandine Degraeve https://orcid.org/0000-0002-0724-2219
Florence Boitrelle https://orcid.org/0000-0002-5322-0141

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