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Chapter two

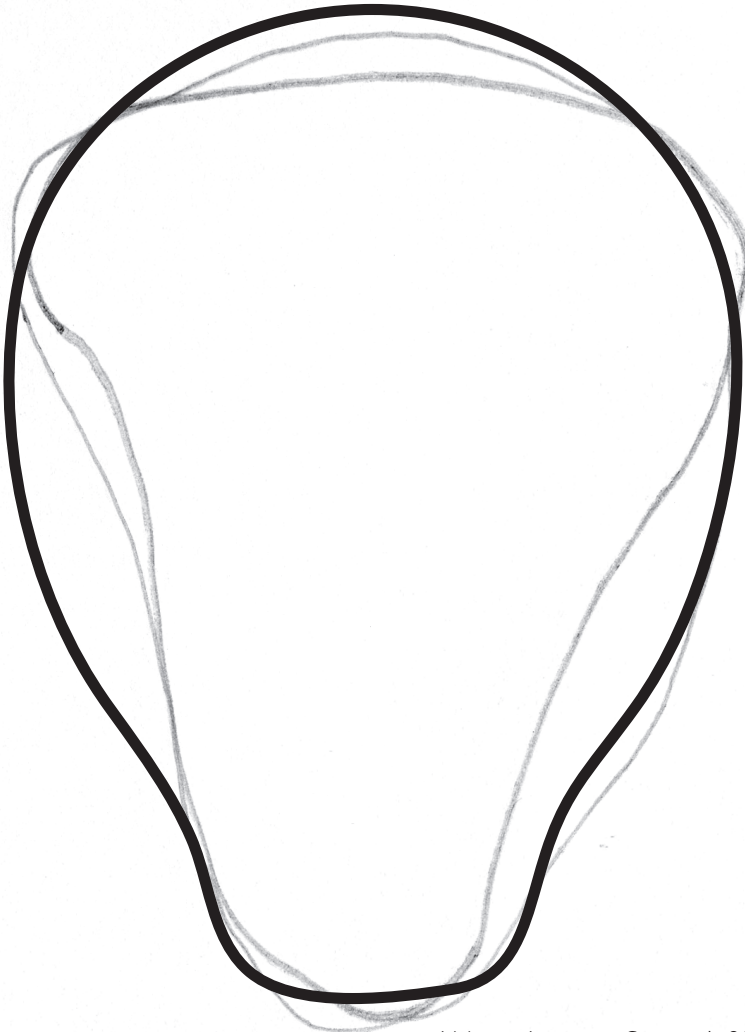
Implementation of advanced laparoscopic surgery in gynecology: national overview of trends

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Abstract

Aim

To estimate the implementation of laparoscopic surgery in operative gynecology.

Materials and Methods

Observational multicenter study in hospitals in the Netherlands. Nationwide annual statistics for 2002 and 2007. A national survey of the number of performed laparoscopic and conventional procedures was performed. Laparoscopy was categorized for complexity in level 1, 2, and 3 procedures. Outcomes were compared with results from 2002 to evaluate trends.

Results

In 2002, 21 414 laparoscopic and 9325 conventional procedures were performed in 74 hospitals (response rate, 74%), and in 2007, 16 863 laparoscopic and 10 973 conventional procedures were performed in 80 hospitals (response rate, 80%). Compared with 2002, in 2007, level 1 procedures were performed significantly less often and level 2 and level 3 procedures were performed significantly more often. The mean number of performed laparoscopic procedures per hospital decreased from 289 to 211 procedures. Teaching hospitals performed more than twice as many therapeutic laparoscopic procedures as nonteaching hospitals do. Cystectomy, oophorectomy, and ectopic pregnancy surgery were preferably performed using the laparoscopic approach. Laparoscopic hysterectomy was performed significantly more often, accounting for 10% of all hysterectomies. Annually, 20% of hospitals in which laparoscopic hysterectomy was implemented performed 50% of all laparoscopic hysterectomies, and 50% of the hospitals performed 20% of laparoscopic hysterectomies.

Conclusion

This study describes increasing implementation of therapeutic laparoscopic gynecologic surgery. Clinics increasingly opt to perform laparoscopic surgery rather than conventional surgery. However, implementation of advanced procedures such as laparoscopic hysterectomy seems to be hampered.

Introduction

When the laparoscopic approach was introduced as a novel minimally invasive diagnostic tool in gynecology by pioneer Raoul Palmer in the late 1940s, one could not envision the vast array of indications in which laparoscopy is used today.¹ Currently, laparoscopy is increasingly practiced by gynecologists throughout the world for ever evolving and challenging indications.²⁻⁴ However, few data are available about the number of laparoscopic procedures performed annually, their distribution among hospitals, and their influence on the number of procedures performed using the conventional approach. Especially for providing accurate training programs, a nationwide insight into distribution between diagnostic and (advanced) therapeutic laparoscopy is useful. Tailor-made skills-training programs during residency and after completing specialty training will enhance patient safety and eventually improve surgical efficiency.⁵

To map these developments accurately, frequent national surveys are necessary.⁶⁻⁸ Such surveys can detect a possible shift in surgical approach used, and adverse results can be traced. As a result, laparoscopic skills-training programs can be adjusted, and certain procedures can be regulated to be performed only in authorized centers. If most hospitals do not perform the complete array of (advanced) laparoscopic procedures, specific expertise must be optimized, and consequently, patient safety will be enhanced. Currently, validation for a minimal number of procedures performed to accomplish the learning curve of advanced laparoscopic surgery such as laparoscopic hysterectomy (LH) is not available.⁹ However, certain studies suggest that, on average, 30 of these procedures must be performed to accomplish the learning curve.^{10,11}

The objectives of this study were to inventory the implementation of gynecological laparoscopic surgery in the Netherlands and to detect and clarify a possible shift in approach from conventional to laparoscopic surgery.

Material and Methods

Each hospital in the Netherlands was asked to complete an electronic mail-based questionnaire about the number of laparoscopic procedures performed in 2007. The questionnaire was subdivided for 15 specific procedures according to the 3-level classification for laparoscopic procedures as given in the guidelines of the Royal College of Obstetricians and Gynaecologists.¹² In addition, the number of procedures performed using the conventional approach was determined. Acquired data were compared with outcomes of a previous national survey published in 2002.⁷ In both surveys, the same set of hospitals was provided with an unaltered questionnaire.

First, for each specific laparoscopic procedure, the mean number of performed procedures was determined and compared with previous outcomes. Second, for hospitals that provided data in 2002 and 2007, an extra analysis was performed to compare implementation tendencies between teaching and nonteaching hospitals. Third, for procedures eligible to be performed using the conventional or laparoscopic approach (e.g., cystectomy, oophorectomy, ectopic pregnancy surgery, and hysterectomy), the percentage of procedures performed conventionally was compared with those performed laparoscopically, and compared with previous outcomes. Fourth, for LH, the percentages of the 3 most common procedures, that is, laparoscopy-assisted vaginal hysterectomy (LAVH), supracervical laparoscopic hysterectomy (SLH), and total laparoscopic hysterectomy (TLH), were compared. Vaginal hysterectomy with accompanying prolapse surgery and radical oncologic abdominal hysterectomy were excluded from the analysis. In addition, to determine any possible variations between hospitals insofar as implementation of LH, we classified hospitals that performed 1 to 10 such procedures annually as low-volume hospitals, those that performed 11 to 20 such procedures as intermediate-volume hospitals, and those that performed more than 30 such procedures as high-volume hospitals.¹⁰

Analysis was performed using commercially available software (SPSS 16.0 statistical software; SPSS, Inc., Chicago, IL). In an attempt to censor any incorrect data, only fully completed questionnaires were included, and when in doubt, accuracy of data was verified with the responding hospital. Differences in mean numbers and percentages between 2002 and 2007 were assessed using linear mixed models to account for possible clustering of hospital responses. We calculated 95% confidence intervals. $P < .05$ was considered significant.

Results

Eighty hospitals (response rate, 80%) provided a complete overview of the number of procedures performed in 2007. The remaining 20 hospitals were unable to gather and supply reliable data because of an inaccurate data recording system. The 80 responding hospitals reflected the national distribution of teaching (44%) and nonteaching (56%) hospitals.

Data for 16 863 laparoscopic and 10 973 conventional procedures were collected in 2007 and compared with the outcomes in 2002 (21 414 laparoscopic and 9325 conventional procedures performed in 74 hospitals). Compared with 2002, in 2007, level 1 procedures were performed significantly less often (mean, 106 procedures per hospital; $P < .001$), and level 2 and level 3 procedures (i.e., therapeutic laparoscopy) were performed significantly more often (mean, +28 procedures; $P < .001$, and mean +9 procedures; $P < .001$, respectively). The number of laparoscopic procedures performed per hospital decreased from 228 procedures in 2002 to 117 procedures in 2007 (mean, -64 procedures; $P < .001$) (Table 1).

A subgroup analysis of the 62 hospitals that provided data in both 2002 and 2007 yielded a significantly greater decrease in level 1 procedures in teaching hospitals compared with

Table 1 Number of laparoscopic procedures per hospital per level of complexity for 2002 and 2007

	2002	2007	Difference	95%-CI	P-value
	Mean (SD)	Mean (SD)			
Level 1					
Diagnostic laparoscopy	78.3 (61.1)	48.3 (41.1)	- 30.0	(-46.7 to -13.4)	< .001
Sterilization	102.3 (63.1)	40.8 (32.1)	- 57.4	(-68.8 to - 46.0)	< .001
Chromopertubation	47.1 (40.9)	30.4 (25.2)	- 16.0	(-24.6 to - 7.7)	< .001
Level 2					
Cystectomy	8.4 (13.6)	15.2 (15.8)	7.0	(3.5 to 10.5)	< .001
Oophorectomy	24.6 (26.4)	41.1 (28.0)	17.8	(10.3 to 25.3)	<.001
Ectopic pregnancy surgery	11.0 (8.9)	13.8 (9.6)	3.7	(1.7 to 5.8)	.001
Endometriosis	3.1 (8.8)	4.1 (9.1)	0.9	(-2.0 to 3.8)	0.53
Adhesiolysis	6.4 (8.4)	4.1 (8.7)	-2.0	(-4.0 to 0.0)	.046
Tubal surgery	2.1 (5.4)	1.9 (5.9)	-0.2	(-1.9 to 1.4)	.79
LAVH	1.9 (7.0)	2.0 (3.9)	0.1	(-1.7 to 1.9)	.89
Level 3					
Laparoscopic myomectomy	0.3 (0.7)	0.4 (1.2)	0.2	(-0.1 to 0.5)	.24
TLH	NA	7.4 (13.4)			
SLH	1.2 (4.0)	2.1 (5.2)	0.9	(-0.4 to 2.2)	.16
Sacropexy	0.9 (3.9)	1.4 (4.5)	0.5	(-0.9 to 1.8)	.50
Lymphadenectomy	0.3 (2.1)	0.1 (0.7)	-0.2	(-0.7 to 0.3)	.52
Total					
Level 1	227.8 (130.6)	116.6 (77.3)	-106.2	(-135.0 to -77.4)	< .001
Level 2	58.9 (54.8)	82.8 (48.7)	28.5	(16.7 to 40.3)	< .001
Level 3	2.7 (7.0)	11.4 (18.4)	9.0	(4.7 to 13.2)	< .001
Total	289.4 (162.5)	210.8 (120.3)	-63.6	(-95.4 to -31.8)	< .001

IC = confidence interval; NA = not applicable; EP = Ectopic Pregnancy; LAVH = Laparoscopic Assisted Vaginal Hysterectomy; TLH = Total Laparoscopic Hysterectomy; SLH = Supracervical Laparoscopic Hysterectomy.

nonteaching hospitals (-44% and -36%, respectively; $P < .05$). Furthermore, teaching hospitals performed more than twice as many therapeutic laparoscopic procedures annually as nonteaching hospitals (mean, 139 procedures and 61 procedures, respectively).

Nationwide, the number of cystectomies and oophorectomies performed using the laparoscopic approach during the last 5 years remained stable (83% and 60%, respectively), whereas ectopic pregnancy surgery was performed significantly more often using the laparoscopic approach, and today is performed in 86% of cases (Figure 1). A significant increase in LH (from 3% in 2002 to 10% in 2007) was observed (Table 2).

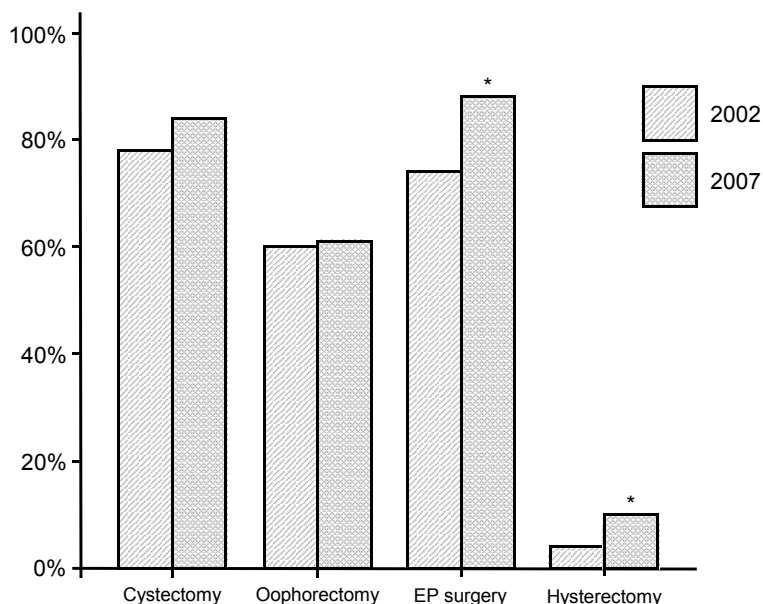


Figure 1 Trends in proportions of laparoscopic approach to cystectomy, oophorectomy, EP surgery and hysterectomy (* = significant increase; P value < 0.05. EP = Ectopic Pregnancy)

Table 2 Distribution of various methods of hysterectomy in 2002 and 2007

	2002		2007		Difference, mean %	95%-CI	P-value
	Mean% (SD)	Mean% (SD)	Mean% (SD)	Mean% (SD)			
Total number of clinics	65		80				
Total number of procedures	8 004		9 476				
Abdominal hysterectomy	68.3% (14.1)	56.2% (15.4)	-12.3	(-16.5 to -8.1)	< 0.001		
Vaginal hysterectomy	29.4% (14.1)	34.1% (16.6)	4.8	(0.8 to 8.8)	0.02		
Laparoscopic hysterectomy	2.4% (6.3)	9.7% (10.9)	7.6	(5.0 to 10.1)	< 0.001		
Number of 'non-LH clinics'	47		24				
Number of procedures	5 469		2 741				
Abdominal hysterectomy	70.4% (14.2)	58.1% (17.8)	-12.3	(-19.9 to -4.6)	0.002		
Vaginal hysterectomy	26.6% (14.2)	41.9% (17.8)	12.3	(4.6 to 19.9)	0.002		
Number of 'LH clinics'	18		56				
Number of procedures	2 535		6 735				
Abdominal hysterectomy	62.6% (12.7)	55.4% (14.3)	-11.5	(-17.6 to -5.3)	.001		
Vaginal hysterectomy	28.9% (14.3)	30.8% (15.1)	4.5	(-2.3 to 11.3)	.19		
Laparoscopic hysterectomy	8.5% (9.6)	13.8% (10.6)	6.5	(2.5 to 10.6)	.003		

LH = Laparoscopic Hysterectomy

In the Netherlands, 56 of 80 (70%) responding hospitals perform LH. Annually, 20% of hospitals in which LH is implemented perform almost 50% of total LH procedures (high-volume hospitals), and 50% of hospitals perform 20% of LH procedures (low-volume hospitals) (Figure 2). Insofar as the various methods of LH, TLH is generally preferred, and is performed in 64% of registered procedures. In low-volume hospitals, LAVH is preferred, and is the method of choice in 44% of registered LH procedures. However, LAVH accounts for only 12% of the total number of LH procedures in hospitals that annually perform more than 10 hysterectomies, compared with 18% for supracervical laparoscopic hysterectomies and 69% for TLHs. Total laparoscopic hysterectomy is performed significantly more often in teaching hospitals compared with nonteaching hospitals (65% vs 23%; $P < .001$).

Discussion

This study demonstrates increasing implementation of therapeutic laparoscopic gynecologic surgery in the Netherlands. Clinics increasingly opt for laparoscopy over the conventional approach. However, implementation of advanced procedures such as LH seems to be hampered. Insofar as implementation of laparoscopy in gynecology in general, there has been

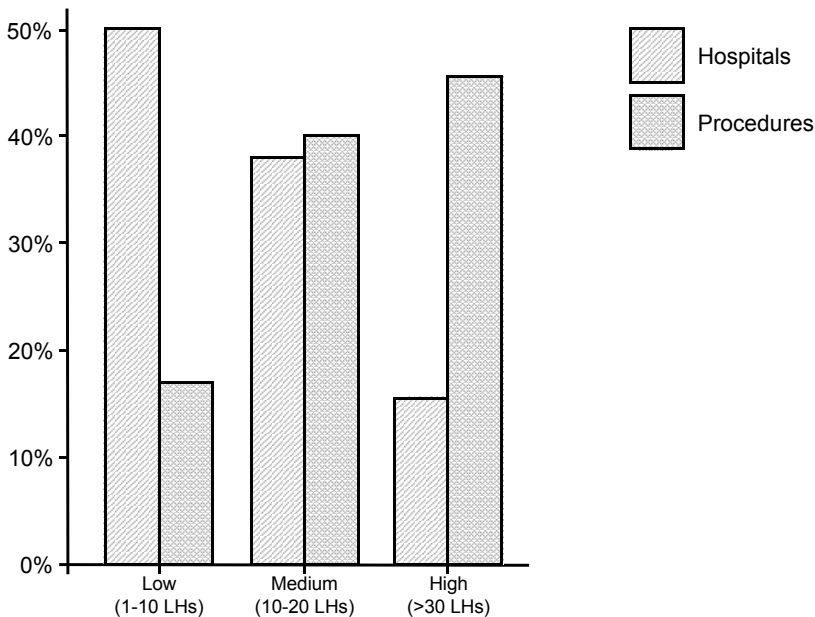


Figure 2 In 2007, less than a fifth of hospitals in which laparoscopic hysterectomy (LH) is implemented perform almost 50% of total LH procedures (high-volume hospitals), and half of hospitals perform less than 20% of LH procedures (low-volume hospitals).

a distinct shift from primarily diagnostic laparoscopy in the late 1990s toward an increasing number of therapeutic procedures currently.⁶

The decrease in the number of performed diagnostic laparoscopies (Table 1) may have been caused by the decline in belief that laparoscopy is a useful tool in the diagnostic workup of, for example, pelvic pain (accompanied with the increased use of improved noninvasive diagnostic tools) in combination with a growing number of “see and treat” laparoscopies (e.g., for diagnosis of ovarian cysts).³³ Furthermore, the decrease in the number of performed laparoscopic sterilizations during the last 5 years is likely caused by development of less invasive alternatives such as hysteroscopic sterilization and the levonorgestrel-releasing intrauterine device, as well as changed insurance coverage in the Netherlands. We hypothesize that the significant decrease in the number of performed chromopertubations is probably the result of speedier referral to in vitro fertilization clinics in combination with nationwide implementation of a less invasive strategy in the diagnostic workup to assess tubal status, hence offering laparoscopy exclusively to patients who test positive for Chlamydia antibody and, consequently, decreasing the number of laparoscopic procedures performed.¹⁴

This shift from diagnostic to therapeutic laparoscopy largely facilitates evolving endoscopic devices combined with an increasing number of training facilities. The latter development is also triggered because minimally invasive surgery is increasingly incorporated in residency training. Perhaps the teach-the-teacher phase for level 2 laparoscopic surgery has been accomplished already.¹⁵ This development is also observed in other areas such as general surgery.^{16,17} Although a variable that is difficult to measure, the influence of surgical companies, with the objective to sell more (nonreusable) instrumentation and, consequently, to increase promotion of laparoscopy rather than conventional surgery, should not be underestimated.

Therapeutic laparoscopy in general, and advanced (level 3) laparoscopy in particular, is still more frequently performed in teaching hospitals. However, nonteaching hospitals seem to be increasingly implementing these techniques as well. The growing applicability of therapeutic procedures explains the preference of gynecologic surgeons for laparoscopy over the conventional approach for cystectomy, oophorectomy, and ectopic pregnancy surgery. However, the hampered implementation of LH seems to be in striking contrast with the increasing growth of these laparoscopic procedures.

Reasons for the hampered implementation of advanced laparoscopic procedures such as LH are many. Whereas most hospitals perform a few LH procedures annually, only a few hospitals perform most of these procedures. A number of reasons could explain this phenomenon. First, because LH, among other level 3 laparoscopic procedures, is not included on the list of compulsory procedures to be acquired during residency training, gynecologists must acquire these skills by themselves, and only after completing their registration. Second, no nationwide standardized guidelines for training in LH are available. Therefore, acquiring the necessary skills is free of obligations, yet cumbersome. Third, possibly in part because of omission of level 3 laparoscopy from the residency program, gynecologists who are willing to implement LH in their hospital need not only acquire the skills themselves but must also convince their colleagues to

refer patients eligible for LH or at least tolerate the addition of LH, with its accompanying novel endoscopic instruments, in the operating room. These restrictions are likely to “condemn” novice LH surgeons to “hobbyism” and to adopt traditional laparoscopic techniques such as LAVH and to perform few LH procedures annually. Overrepresentation of the percentage of performed LAVHs (49%) in low-volume hospitals, as demonstrated by our data, supports this assumption.

Furthermore, there is concern about another development in the field of LH: implementation of LH seems to hamper the number of vaginal hysterectomies performed. This development is undesirable because vaginal hysterectomy is the method of choice in hysterectomies performed because of benign indications.¹⁸ Inasmuch as LH originally was introduced as an alternative to the abdominal approach, a larger decrease in the number of abdominal hysterectomies would be expected.^{19;20} However, in our study, we observed only a minor difference in the percentage of abdominal hysterectomies performed (55% vs 58% for clinics that do or do not perform LH).

Hypothetically, because of the learning curve of LH during the implementation phase, surgeons perhaps continue to select candidates for abdominal hysterectomy while also performing LH in patients who are candidates for vaginal hysterectomy. However, comparison of distribution of the various methods of hysterectomy between high- and low-volume hospitals does not support this assumption. Our data reflect only the number of hysterectomies per hospital and do not provide information per individual surgeon, and in addition, our data do not take into account the possible number of external referred candidates for LH. Nevertheless, the unexpected influence of LH on its conventional counterparts (i.e., abdominal hysterectomy and vaginal hysterectomy) is indisputable. In our opinion, a restructured residency training program with optimized training in both vaginal and laparoscopic surgical techniques, accompanied by increased awareness of the advantages of these minimally invasive techniques, could effectively reduce the number of abdominal hysterectomies. Thus, we stress that LH is not the criterion standard and that not every patient is a candidate for TLH. Appropriate case selection will, it is hoped, more often offer patients access to vaginal hysterectomy before LH is considered.

A shortcoming of the present study might be the guaranteed reliability of the provided data. In contrast with countries such as Finland, gynecologists in the Netherlands do not have yet a national standardized registration system for operative procedures.⁹ Therefore, retrieval of data for this study depended on the willingness and dedication of colleague gynecologists to gather and supply the requested data. Another limitation of this study might be its retrospective design. However, because no national prospective registration system is yet available, retrospective studies such as this are needed to gain insight into implementation tendencies. We would like to encourage other countries to frequently retrieve and publish national data on laparoscopic procedures as well, to monitor possible developments in this field.

It might be argued that the reported decreasing influence of LH on the number of vaginal hysterectomies performed is caused by concurrently evolving novel prolapse surgery techniques such as tension-free vaginal tape surgery. However, similar to 2002, in 2007, vaginal hysterectomies with accompanying prolapse surgery were excluded from analysis. Therefore, a reliable representation of tendencies was established.

In conclusion, the present study describes current tendencies in gynecologic laparoscopic surgery. Therapeutic laparoscopy seems to be readily implemented. However, there is concern about certain developments in the field of advanced laparoscopy. Permanent prospective research of gynecologists performing advanced laparoscopic procedures such as LH is needed to gain insight into indications, patient characteristics, procedure-related outcomes, and surgeon characteristics. With use of these data, evidence-based guidelines can be established for certification and accreditation of surgeons to perform advanced laparoscopic procedures. Before options such as centralizing certain advanced laparoscopic procedures can be outlined, a patient-centered optimum for operative gynecologic laparoscopic surgery must be assessed.

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