Research Square

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Ambulatory Hernia Repair: A Study of 1294 Patients in a Single Institution

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Research Article

Keywords: Surgery, Ambulatory, Hernia

Posted Date: September 22nd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-908169/v1

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Abstract

Background:

Ambulatory surgery is defined as surgery without an overnight hospital stay, which allows the patient to return home on the same day of admission after the surgical procedure. It is increasing countinuously in the world because of its several advantages. This study aimed to describe the experience of our department in outpatient hernia surgery, evaluate its feasibility and safety, and determine the predictive factors for failure of this surgery.

Results:

We collected 1294 patients. One thousand twenty patients underwent groin hernia repair (GHR). The failure rate of ambulatory management of GHR was 3.7%: 31 patients (3%) had an unplanned admission (UA) and 7 patients (0.7%) had an unplanned rehospitalisation (UR). Morbidity rate was 2.4% (24 patients) and mortality rate was zero. In multivariate analysis, we did not identify any variable predicting discharge failure in the GHR group. Two hundred and seventy-four patients underwent ventral hernia repair (VHR). The failure rate of ambulatory management of VHR was 5.5%: 11 patients (4%) had a UA and 4 patients (1.5%) had an UR. Morbidity rate was 3.6% (10 patients) and the mortality rate was zero. In multivariate analysis, we did not identify any variable predicting discharge failure in the VHR group.

Conclusions:

Our study data suggest that ambulatory hernia surgery is feasible and safe in well-selected patients. The development of this practice would allow for better management of eligible patients and would offer many economic and organisational advantages to healthcare structures.

Introduction:

Ambulatory surgery is defined as surgery without an overnight hospital stay, which allows the patient to return home on the same day of admission after the surgical procedure. Apart from its advantages in terms of patient comfort and reduced risk of nosocomial infections, it is of great economic interest by reducing the expenses related to conventional hospitalisations [1]. The rate of ambulatory surgery in the world is increasing continuously. In Tunisia, our experience began in 2008 at the Habib Thameur University Hospital in Tunis. The main surgical practices are groin hernia repair (GHR), ventral hernia repair (VHR), laparoscopic cholecystectomy and proctology. This study aimed to describe the experience of our department in outpatient hernia surgery, evaluate its feasibility and safety, and determine the predictive factors for failure of this surgery.

Patients And Methods:

We conducted a monocentric retrospective cohort study considering patients operated on for ambulatory GHR and VHR in the general surgery department of the Habib Thameur Hospital in Tunis between January 1st, 2008 and December 31st, 2016.

Inclusion criteria were the following: age ≤ 16 years, American Society of Anaesthesiologists (ASA) Grade I or II, the availability of an adult companion during the first 48 hours after surgery, a distance of 50 km or less from the hospital, and patient agreement and consent to the ambulatory procedure. The non-inclusion criteria were: age < 16 years, ASA Grade ≥ III, on chronic anticoagulants, with allergies to anaesthetic drugs, with recurrent or strangulated hernias or large ventral hernia (VH) with an expected parietal defect of > 10 cm. The exclusion criteria were: the necessity of drainage and large VH with a parietal defect of > 10 cm.

Day surgery unit organisation and patient flow:

We conducted this study in the first-day surgery unit, an isolated satellite structure located in the general surgery department. It includes a waiting room, an operating room, two post-interventional monitoring rooms (PIMRs) with a total capacity of four patients, a restroom, a changing room, an office for the medical and paramedical staff and a sterilisation room.

Patients were hospitalised at 7 am. They were transferred to the operating room after being examined by the surgeon. The anaesthesia protocol depended mainly on the anesthesiologist, who considered the ambulatory aspect of the procedure when choosing the appropriate anaesthetic drugs. After surgery, the patients were transferred to the PIMR. Before a patient could safely be discharged from the PIMR, a careful examination was conducted. We used the modified Aldrete score, which assesses five parameters: respiration, blood pressure, consciousness, colour and activity level. Each parameter is scored 0, 1 or 2, and patients scoring nine or greater were eligible to be transferred to the restroom.

The hospital discharge was carried out the same day as the procedure, before 7 pm. The necessary conditions for discharge were: stability of vital signs, a well-tolerated oral liquid diet, ambulation without dizziness, efficiency of the oral analgesia, a spontaneous micturition, the absence of nausea and vomiting, the patient's agreement for the discharge, the availability of an adult companion during the first 48 hours after surgery and discharge before 7 pm.

Definitions:

The analysis was based on the success or failure of the ambulatory procedure. The study compared two groups:

a) The ‘successful discharge’ group included patients who were operated on and discharged on the same day as surgery before 7 pm with no unplanned readmission or postoperative re-operation, and

b) The ‘discharge failure’ group, which included:

– unplanned admissions (UAs) occurring before the patient's discharge from the hospital.

– unplanned rehospitalisations (URs) occurring after the patient's discharge during the 48 hours following surgery.

Statistical Analysis:

Statistical analysis was performed using SPSS 23.0 (Statistical Package for the Social Sciences software for Windows). Qualitative and quantitative data were compared using the Chi-squared test and the Student's t-test, respectively. The significance level was set at 0.05. We compared the two groups 'successful discharge' and 'discharge failure' with regard to their demographic characteristics, ASA classes, type of hernia, anaesthesia and surgical technique used, operative time, success or failure of discharge on the same day of surgery, and postoperative morbidity and mortality. We performed a bivariate analysis, and then variables associated with $p \leq 0.05$ and significant variables in the literature were introduced into a multivariate logistic regression model to identify predictive factors for failure.

Results:

A total of 1294 patients were included.

Groin Hernia Repair:

One thousand and twenty patients underwent GHR. The mean age was 45 ± 10.2 years (17–88 years). The population was made up mainly of male patients (95%). Eight hundred and twenty-seven patients (81.1%) were of ASA Grade I and 193 (18.9%) ASA Grade II. Eight hundred and two patients (78.6%) had an inguinal hernia, 162 (15.9%) an inguinoscrotal hernia and 56 (5.5%) a femoral hernia. Seventy-two patients (7.1%) were operated on under general anaesthesia (GA), and 948 (92.9%) under spinal anaesthesia. The Lichtenstein technique was performed in 518 patients (50.8%), the Bassini technique in 441 patients (43.2%), the Mac Vay technique in 44 patients (4.3%), the Rives technique in 12 patients (1.2%), and the Shouldice technique in five patients (0.5%). The Bassini technique was mainly used during the first years of the study, but since 2015 the Lichtenstein technique was exclusively used for inguinal hernias. The mean operation time was 51 ± 9 minutes (30–95 minutes).

The success rate of the ambulatory procedure was 96.3%. Thirty-one patients (3%) had a UA, the causes for which were the following: postoperative pain (POP) in nine patients (29%), headache and vertigo in nine patients (29%), postoperative nausea and vomiting (PONV) in seven patients (22.6%), supporting problems in four patients (12.9%), and acute urinary retention in two patients (6.5%; Table 1).

Table 1
Causes of unplanned admissions after groin hernia repair

Causes of unplanned admissions (UAs)	**N (%)**
Postoperative pain (POP)	9 (29%)
Headache/vertigo	9 (29%)
Postoperative nausea and vomiting (PONV)	7 (22,6%)
Supporting problems	4 (12,9%)
Acute urinary retention	2 (6,5%)
Total	**31**

Seven patients (0.7%) had a UR, the causes for which were the following: abdominal wall haematoma in three patients (42.8%), acute urinary retention in two patients (28.6%) and haematocele in two patients (28.6%; Table 2).

Table 2
Causes of unplanned rehospitalisations after groin hernia repair

Causes of unplanned rehospitalisations (URs)	**N (%)**
Abdominal wall heamatoma	3 (42,8%)
Acute urinary retention	2 (28,6%)
Heamatocele	2 (28,6%)
Total	**7**

The failure rate of ambulatory management of GHR, the sum of UA and UR, was therefore 3.7%.

In bivariate analysis, we found that the variables age, GA, Lichtenstein technique and operation time were significantly more likely to lead to discharge failure in GHR patients ($p < 10^{-3}$, $p = 0.004$, $p < 10^{-3}$ and $p < 10^{-3}$, respectively; Table 3).

Table 3
Comparison of ‘discharge failure‘ and ‘successful discharge‘ groups after groin hernia repair.

Variables		Discharge failure	Successful discharge	P
Total	1020	38 (3,7%)	982 (96,3%)	
Age		56 ans ± 12	45 ans ± 10	**< 10 – 3**
Gender	Male	35 (3,6%)	934 (96,4%)	0,432
ASA Grade	ASA I	30 (3,6%)	797 (96,4%)	0,677
	ASA II	8 (4,1%)	185 (95,9%)	
Type of anaesthesia	GA	8 (11,1%)	64 (88,9%)	**0,004**
Type of hernia	Inguinal hernia (IH)	27 (3,4%)	775 (96,6%)	0,068 (IH vs ISH)
	Inguinoscrotal hernia (ISH)	11 (6,8%)	151 (93,2%)	0,099 (ISH vs FH)
	Femoral hernia (FH)	0 (0%)	56 (100%)	0,317 (IH vs FH)
Surgical technique	Lichtenstein	33 (6,4%)	485 (93,6%)	**< 10 – 3** (Lichtenstein vs Bassini)
	Bassini	5 (1,1%)	436 (98,9%)	
	Mac Vay	0 (0%)	44 (100%)	
	Rives	0 (0%)	12 (100%)	
	Shouldice	0 (0%)	5 (100%)	
Mean operative time		57 min ± 9	50 min ± 8	**< 10 – 3**

In multivariate analysis, we did not identify any variable predicting discharge failure in the GHR group.

Complications occurred in 24 patients (2.4%). These consisted of abdominal wall haematoma in eight patients (33.3%), acute urinary retention in eight (33.3%), cutaneous abscess of the abdominal wall in five (20.8%), haematocele in two (8.4%) and hydrocele in one patient (4.2%). The death rate after GHR management was zero.

Ventral Hernia Repair:

Two hundred and seventy-four patients underwent VHR. The mean age was 43.7 ± 11.9 years (17–80 years). Ninety patients (32.8%) were male and 184 (67.2%) female. Two hundred and ten patients (76.6%) were of ASA Grade I and 64 (23.4%) ASA Grade II. One hundred and eighty patients (65.7%) had an umbilical hernia (UH) and 94 (34.3%) an epigastric hernia (EH).

All the patients were operated on under GA. One hundred and forty-eight patients (54%) underwent mesh repair, while 126 (46%) underwent suture repair. The mean operation time was 42 ± 8 minutes (20–65 minutes).

The success rate of the ambulatory procedure was 94.5%. Eleven patients (4%) had a UA, the causes for which were the following: PONV in four patients (36.3%), POP in three (27.3%), headache, vertigo in two (18.2%) and supporting problems in two patients (18.2%; Table 4).

Table 4
Causes of unplanned admissions after ventral hernia repair

Causes of unplanned admissions (UAs)	**N (%)**
Postoperatvie nausea and vomiting (PONV)	4 (36,3%)
Postoperatvie pain (POP)	3 (27,3%)
Headache/vertigo	2 (18,2%)
Supporting problems	2 (18,2%)
Total	**11**

Four patients (1.5%) had a UR for the following reasons: abdominal wall haematoma in two patients (50%) and seroma in two patients (50%; Table 5).

Table 5
Causes of unplanned rehospitalisations after ventral hernia repair

Causes of unplanned rehospitalisations (URs)	**N (%)**
Abdominal wall heamatoma	2 (50%)
Seroma	2 (50%)
Total	**4**

The failure rate of ambulatory management of VHR was therefore 5.5%.

In bivariate analysis, we found that the variables age, ASA Grade II and operation time were significantly more likely to lead to discharge failure in VHR patients ($p < 10^{-3}$, $p < 10^{-3}$ and $p = 0.033$, respectively; Table 6).

Table 6
Comparison of ‘discharge failure’ and ‘successful discharge’ groups after ventral hernia repair.

Variables		Discharge failure	Successful discharge	P
Total	274	15 (5,5%)	259 (94,5%)	
Age		61 ans ± 8	43 ans ± 11	**$p < 10^{-3}$**
Gender	Male	5 (5,5%)	85 (94,5%)	1
ASA Grade	ASA I	4 (1,9%)	206 (98,1%)	**$p < 10^{-3}$**
	ASA II	11 (17,2%)	53 (82,8%)	
Type of hernia	Umbilical hernia (UH)	10 (5,5%)	170 (94,5%)	1
	Epigastric hernia (EH)	5 (5,3%)	89 (94,7%)	
Type of anesthesia	Mesh repair	8 (5,4%)	140 (94,6%)	1
	Suture repair	7 (5,6%)	119 (94,4%)	
Meanoperative time		46 min ± 7	41 min ± 8	**0,033**

In multivariate analysis, we did not identify any variable predicting discharge failure in the VHR group.

Complications occurred in 10 patients (3.6%). These consisted of cutaneous abscess of the abdominal wall in four patients (60%), abdominal wall hematoma in two (20%) and seroma in two patients (20%). The death rate after VHR management was zero.

Discussion:

These results suggest that ambulatory hernia surgery is feasible and safe. Nevertheless, appropriate patient selection is essential to achieve such results. The selection criteria are not just medical but are also related to environmental and psychosocial factors [2].

In the literature, inclusion criteria vary according to authors. Bringman set an age limit of fewer than 75 years [3]; other authors, such as Mamie and Metzger, set an age limit of under 65 years [4]; this should minimise failure rates, especially in elderly patients. There were no age limits for other series, such as by Kurzer [5], Sanjay [6] or Kark [7]. In our study, advanced age was not a contraindication; we included all patients whose age was over 16 years. Some series, such as by Arroyo [8] included patients with ASA Grade III. In the French Society of Anaesthesia and Intensive Care (SFAR) recommendations, outpatient anaesthesia is preferentially intended for ASA Grade I and II patients. But some ASA Grade III patients can be eligible with some conditions: stabilised pathology under adapted treatment, negligible interferences between the intervention and the underlying pathologies and prior agreement between the surgeon and anaesthetist [9]. In most studies, bilateral or recurrent hernias were not a limitation to outpatient

management. According to some authors, such as Drissi and Kark, these two factors were not associated with a higher risk of failure of the ambulatory procedure [7, 10–12].

In our study, patients under 16 years of age with an ASA Grade ≥ III, on long-term anticoagulants or under a medical treatment requiring its interruption before surgery, patients who were allergic to the anaesthetic drugs, had large VH of ≥ 10 cm or recurrent and strangulated hernias were not included.

In some series such as by Drissi or Hanes [13, 14], the principal exclusion criteria were: strangulated hernias undergoing emergency surgery, large VH, large inguinoscrotal hernias and the necessity of drainage. According to SFAR, the specific exclusion criteria for ambulatory hernia procedures are: complicated hernias undergoing emergency surgery, bulky and/or incarcerated inguinoscrotal hernias and large VH [9].

Hernias requiring drainage and bulky VHs with a wall defect of > 10 cm were excluded in our series.

The pre-anaesthesia evaluation should be carried out several days before surgery. All anaesthesia techniques can be performed, and there are no specific techniques for outpatient procedures, but drugs with a shorter duration of action are recommended [15]. Patients must undergo the same pre-operative monitoring and surveillance as those in inpatient care [16]. The surgical principles and techniques are the same as those performed in traditional inpatient surgery [1]. According to several authors, the procedure should be performed by an experienced surgeon or under the supervision of a senior physician [17]. In our study, all patients were operated on by a senior or under the supervision of a senior, aiming to reduce the operation duration and the morbidity rate in order to minimise the failure rate of outpatient management. The main surgical procedures performed in our day surgery unit are hernia surgery, proctology, laparoscopic cholecystectomy and lipoma surgery. We have only included in our work the hernia surgery that we performed exclusively by laparotomy. The surgical techniques varied according to the preferences of the surgeon.

After surgery, patients are transferred to a PIMR, where careful and continuous monitoring is carried out [18]. The monitoring time varies between patients and depends mainly on the type and duration of anaesthesia and the occurrence of intraoperative events [16]. The medical and surgical staff must carry out a standardised protocol for anticipatory control of POP and PONV [19–21]. Locoregional analgesia (LRA) is recommended. The surgeon should infiltrate the surgical wound with long-acting local anaesthetics as soon as possible, as this will significantly reduce the incidence of POP [22, 23]. Morphine use should be avoided as it can cause PONV and urinary retention [24]; it should be reserved for severe and resistant pain [15]. The use of NSAIDs significantly reduces PONV, particularly through opioid sparing [22, 24]. A therapeutic approach combining intraoperative droperidol and dexamethasone, while reserving strong antiemetics such as setrons for curative treatment, is quite satisfying in this context [22, 25].

Discharge from the PIMR is conditioned by several clinical monitoring parameters combined into scores, the most commonly used being the modified Aldrete score [26]. Once the patient has a score of 9 or higher, he/she can be transferred to the restroom [15, 16]. In our study, we also used the modified Aldrete

score. The surgeon and the anaesthetist must approve the patient's discharge after a medical evaluation, and a prescription can be delivered by one of the physicians of the structure [1]. The majority of authors agree that before discharge patients must be perfectly conscious, tolerate oral feeding, have spontaneous urination, do not require parenteral analgesia, and be able to walk on their own without assistance, with the mandatory presence of an adult companion [15, 20, 27–29].

In this context, the use of a predetermined score is recommended to facilitate this step. The most commonly used score is the PADSS 'discharge' score, which considers vital signs (heart rate and blood pressure), ambulation, POP and PONV, the eventual occurrence of bleeding, and nutrition. A score of ≥ 9 allows the patient to be discharged [29].

By analysing the different outpatient hernia surgery series, we found very encouraging results, with success rates ranging from 74 to 100% [10, 12, 17, 30, 31]. Drissi's multicentric study reported 6974 patients that underwent ambulatory GHR between 2011 and 2015, achieving a success rate of 96.4% [10]. A French study performed by Ngo on 242 patients undergoing ambulatory hernia surgery between June 2008 and October 2009 reported a success rate of 96.7% [30]. The failure rate of the ambulatory procedure is estimated by the rate of UAs and URs [10, 17]. In our study, the failure rate was 3.7% in GHR patients and 5.5% in VHR patients, while the success rate was 96.3% in GHR patients and 94.5% in VHR patients.

The rate of UA ranges from 0% and 19% in the literature [7, 10, 17, 30, 32–34]. Ngo et al. reported a UA rate of 2.6% [30]. Drissi et al. included 6974 patients in their study and reported a UA rate of 3.6%. The main causes of failure were: headache and vertigo (20.6%), POP (15.7%), acute urinary retention (9.9%), supporting problems (7.6%), bleeding (4.6%), PONV (4.2%), and late discharge from the operating room (3.4%)[10]. A Belgian study published in 2018 by Van Caelenberg et al. [34], including 5156 patients that underwent ambulatory surgery, had a missed discharge rate of 2.89%. The main causes for UA were: socioeconomic and supporting problems (distance from the hospital, companion problems, late discharge from the operating room, etc.) in 45.52%, POP in 11.72%, bleeding and abdominal wall hematoma in 10.34%, acute urinary retention in 3.3%, PONV in 2% and medical causes in 5.52% (pulmonary embolism, pneumonia, epilepsy, syncope, etc.).

The UR rate ranges from 0–9% in the literature [17, 30, 33–37]. In Ngo's series, a rate of 0.7% of rehospitalisations was observed [30]. A multicentre Finnish study by Mattila et al., including more than 6500 patients having outpatient surgery in 2009 for several surgical pathologies including hernia, found a rate of post-discharge consultations of 5.9% and a UR rate of 0.7% [35]. The different UR causes in the literature include: bleeding and abdominal wall haematoma, acute bowel obstruction, POP, acute urinary retention, headache and vertigo, fever and thromboembolic events [5, 6, 8, 35, 38–42].

To improve results and decrease the rates of UA and UR, several series have studied the predictive factors of failure of the ambulatory procedure [10, 33, 34, 43–45]. Drissi et al. [10] analysed these factors through a multivariate statistical study and concluded that an ASA Grade ≥ III, bilateral and/or strangulated hernias and spinal anaesthesia were predictive factors for failure.

Van Caelenberg et al. [34] found a failed discharge rate of 2.89%, related to longer operative duration, late discharge from the operating room and ASA Grade ≥ III. In Whippey's Canadian study published in 2013 [33], including 20,657 patients undergoing ambulatory surgery, the failed discharge rate was 2.67%. Predictive factors for failed discharge were: duration of surgery of more than one hour, ASA Grade ≥ III, advanced age (> 80 years), and a body mass index (BMI) between 30 and 35 kg/m². On the other hand, active smoking was associated with a reduced probability of failed discharge.

Our study did not observe any statistically significant variable as a predictor of discharge failure by multivariate analysis. We summarise in Table 7 the results of the different series according to morbidity and success or failure of the ambulatory procedure.

Table 7
Results of the different series according to morbidity and success or failure of ambulatory procedure.

Serie	N	Morbidity	Mortality	Succes rate	Unplanned admissions (UAs)	Unplanned rehospitalisations (URs)
Ngo et al [17]	242	3,3%	0%	96,7%	2,6%	0,7%
Drissi et al [22]	6974	7,3%	-	96,4%	3,6%	-
Van Caelenberg et al [54]	5156	-	-	-	2,89%	-
Mattila et al [67]	6659	-	-	-	5,9%	0,7%
Whippey et al [57]	20657	-	-	-	2,67%	-
Majholm et al [76]	57709	-	0,0004%	-	-	1,21%
De Lange et al [83]	3284	5,9%	0,12%	-	-	-
Our serie (groin hernia repair)	1020	2,4%	0%	96,3%	3%	0,7%
Our serie (ventral hernia repair)	274	3,6%	0%	94,5%	4%	1,5%

The benefits of outpatient hernia surgery are currently recognised, as shown by the very high satisfaction rates of patients operated on in this mode, which are over 90% in most series [1, 23, 29, 46–48].

Ambulatory management decreases the rate of nosocomial infections. Indeed, early patient discharge reduces the probability of being exposed to infection [1]. It also allows more comfortable care, inducing fewer daily changes in the patient's life and environment than conventional surgery [49].

Ambulatory surgery is also of major economic benefit. This is partly due to reduced hospitalisation expenses, such as parenteral drug prescriptions and hygiene and maintenance costs [1, 50]. It also allows

for better hospital resource management by devoting full hospitalisation bed capacity and nursing staff energy to patients with more serious pathologies [50].

Conclusions :

The ambulatory practice has become the reference procedure in hernia surgery when the necessary safety conditions are provided. The development of advanced surgical techniques and the advent of short-acting anaesthetic drugs have contributed to the expansion of this practice. In terms of quality of care, the excellent patient satisfaction rate confirms the acceptability of this surgery. Our study data suggest that ambulatory hernia surgery is feasible and safe in well-selected patients. The development of this practice would allow for better management of eligible patients and would offer many economic and organisational advantages to healthcare structures.

Declarations

Ethics approval and consent to participate:

The study protocol was in accordance with the national Tunisian ethical standards and the ethical guidelines of the 1975 Declaration of Helsinki (6th version, 2008). Due to the study retrospective nature, it was not necessary to obtain the patients' informed consent for the analysis of their personal data.

Consent for publication:

Not applicable.

Availability of data and material:

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that they have no competing interests.

Funding:

There is no fund supporting this study.

Authors' contributions :

M.H and D.H: acquisition and interpretation of data, drafting the manuscript, conception and design; M.C, A.Z and N.K: interpretation of data, conception and design; A.M and A.B.M: interpretation of data, critical revision, gave final approval of the version to be published. All authors read and approved the final manuscript.

Acknowledgements :

Not applicable.

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