





Evaluation of the real applicability of diagnosis related groups for benign prostate surgery

Avaliação da aplicabilidade real do Diagnosis-Related Groups para cirurgias benignas da próstata

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ABSTRACT

Introduction: The treatment of benign surgical hyperplasia includes transurethral resection of the prostate (TURP) and open prostatectomy, which have distinct indications. Diagnosis Related Groups (DRG) is a classification system of patients with similar standards for predicting hospital products and services. However, some DRG codes include several treatment regimens, such as 707 and 708, which include TURP and open prostatectomy. **Objective:** To compare hospital stay and adverse events for TURP and open prostatectomy. **Methods:** Cross-sectional, retrospective, quantitative study, in which 279 urology patients submitted to TURP or open prostatectomy were selected between 2017 and 2021, classified as code DRG 707 or 708, which refer to major male surgeries of the pelvic region with comorbidities and major male surgeries of the pelvic region without comorbidities, respectively. Patients were divided into two groups, 220 selected for TURP and 59 for open prostatectomy. **Results:** There was a significant difference in hospital stay ($p < 0,001$): 2.1 (2.0-2.3) days in TURP vs. 3.1 (3.0-4.3) days in open prostatectomy. A significant difference was also observed in the frequency of adverse events ($p = 0.04$): in TURP, the frequency was 7.7% and in prostatectomy it was 22%. There was no significant difference in comorbidities between the two groups. **Conclusion:** TURP presented minor hospital stay and minor frequency of adverse events when compared to open prostatectomy. We suggest a stratification of DRG codes 707 and 708, so that benign surgeries can be included in different codes.

Keywords: Prostatic hyperplasia; Transurethral resection of prostate; Prostatectomy; Diagnosis-related groups.

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RESUMO

Introdução: O tratamento cirúrgico da hiperplasia benigna de próstata inclui a ressecção transuretral da próstata (RTUP) e a prostatectomia aberta, que apresentam indicações distintas. O *Diagnosis Related Groups* (DRG) é um sistema de classificação de pacientes com padrões clínicos semelhantes para previsão de produtos e serviços hospitalares. No entanto, alguns códigos do DRG incluem amplo espectro de regimes terapêuticos, como 707 e 708, que contêm RTUP e prostatectomia aberta. **Objetivo:** Comparar o tempo de permanência hospitalar e taxas de complicação da RTUP e prostatectomia aberta. **Métodos:** Estudo transversal, retrospectivo de caráter quantitativo, que selecionou 279 pacientes urológicos submetidos a RTUP ou a prostatectomia, entre 2017 até 2021, relativos ao DRG 707 e 708, que são referentes às cirurgias maiores da região pélvica masculina com comorbidades e às cirurgias maiores da região pélvica masculina sem comorbidades, respectivamente. Os pacientes foram divididos em dois grupos, 220 submetidos a RTUP e 59 submetidos a prostatectomia. **Resultados:** Foi observado diferença significativa no tempo de internação ($p < 0,001$), sendo 2,1 (2,0- 2,3) dias na RTUP e 3,1 (3,0-4,3) dias na prostatectomia. Também foi observado diferença significativa na frequência de eventos adversos ($p = 0,004$), na RTUP a frequência foi de 7,7% e na prostatectomia foi de 22%. Não houve diferença significativa nas comorbidades entre os dois grupos. **Conclusão:** A RTUP apresenta menor tempo de internação e menor frequência de eventos adversos quando comparada a prostatectomia aberta. Sugerimos uma estratificação dos códigos DRG 707 e 708, para que as cirurgias benignas da próstata sejam incluídas em códigos distintos.

Palavras-chave: Prostatic hyperplasia; Transurethral resection of prostate; Prostatectomy; Diagnosis-related groups.

INTRODUCTION

Surgical treatment of benign prostatic hyperplasia (BPH) mainly includes transurethral resection of the prostate (TURP) and open prostatectomy. The latter became less used after the emergence of TURP, which represents the gold standard surgical treatment for BPH for prostates smaller than 60 grams. The open prostatectomy procedure is indicated for prostates over 80 grams and is an invasive therapy with a prolonged hospital stay and a longer period of inactivity¹.

Diagnosis Related Groups (DRG) is a classification system for patients undergoing hospital admissions that was developed to predict products and services to be performed in patients with similar clinical patterns². Based on DRG, a financing system was developed which has gained prominence and has been implemented in several countries, including Brazil³. This system has two main features:

numerous inpatient services are classified into a limited number of groups, and the basic rate of reimbursement to health care providers is based on the average cost of each group, with or without adjustment for the regional economic status or characteristics of the hospital⁴.

In some areas, a single DRG code classifies patients who receive a broad spectrum of treatment regimens². As an example, DRG codes 707 and 708 can be mentioned, which refer to major male pelvic surgeries with comorbidities and to major male pelvic surgeries without comorbidities, respectively, and includes TURP and open prostatectomy. Considering that the DRG advocates the classification of patients into homogeneous groups, it is important to continuously evaluate the groups of existing surgical procedures.

The aim of this study is to compare the hospital stay and adverse events of the two procedures, TURP and open prostatectomy, which are coded in the same DRG code.

METHODS

This is a cross-sectional, retrospective, quantitative study. 279 patients who underwent open prostatectomy or TURP were selected, included under DRG code 707 and 708 in a university hospital in Belo Horizonte, Minas Gerais, between September 2017 and February 2021. As an inclusion criterion, the procedure was open prostatectomy or TURP, which are present in DRG 707 (major male pelvic surgeries with comorbidities) or DRG 708 (major male pelvic surgeries without comorbidities). There were no exclusion criteria. This work was approved by the research ethics committee linked to *Faculdade Ciências Médicas de Minas Gerais* (decision number: 4,831,035) and had the justification for the waiver of the Free and Informed Consent Term accepted.

STUDY DESIGN

This study evaluated the following independent variables: age, comorbidities and prostate weight; and the following dependent variables: hospital stay and adverse events. Only the prostate weight of patients with pelvic ultrasound reports attached to the medical records were considered. The hospital stay began on the day of the procedure up to hospital discharge. For data comparison, patients were divided into two groups, the first referring to those undergoing TURP (n=220), and the second, those undergoing open prostatectomy (n=59).

DRG

For the classification of DRG, the following variables are used: main and secondary diagnoses, age and sex of the patient, presence of comorbidities and complications and procedures performed⁵. According to the operational manual DRG Brasil, the average hospital stay expected for patients grouped in DRG 707 is 3.1 days and in DRG 708 it is 2.2 days⁶.

SURGICAL TECHNIQUE

Open prostatectomy procedures were performed using the Milin technique. This technique consists of an infraumbilical abdominal incision followed by enucleation of the adenoma via the retropubic route and allows visualization of the prostatic apex and the entire prostatic fossa, which allows for greater control of bleeding and the review of hemostasis after enucleation⁷.

In the TURP procedure, the prostate is accessed via the urethral route. Bladder irrigation is performed and prostate tissue is removed by electrocautery. The fluid used for irrigation was 3.3% sorbitol, which is related to water intoxication only when large amounts are absorbed⁸⁻¹⁰.

STATISTICAL ANALYSIS

Categorical variables were presented as absolute and relative frequencies and numerical variables as median (1st quartile - 3rd quartile). The associations between the variables and the surgical procedure were evaluated by the

chi-square test, and the comparisons of age and hospital stay with the surgical procedure by the Mann-Whitney U test. The analyses were performed using R software version 4.0.3 and a significance level of 5% was considered.

RESULTS

In this study, 279 male patients with a median age of 67.8 years (62.0-73.0) were evaluated. In the sample evaluated, 166 patients (59.5%) had some comorbidity, with systemic arterial hypertension being the most frequent. Regarding the surgical procedure, 220 patients underwent TURP (79.8%) and 59 (22.1%) underwent open prostatectomy. 55.4% of the sample had a prostate weight of less than 70 grams. The length of hospital stay was 2.2 days (2.0-3.0). The adverse event rate was 10.8% (Table 1).

71.3% of patients undergoing TURP (n=220) had prostate weight less than 70 grams. 88.5% of patients undergoing open prostatectomy (n=59) had a prostate weight greater than 100 grams. The length of hospital stay for patients undergoing TURP was 2.1 days (2.0-2.3) and for patients undergoing open prostatectomy it was 3.1 (3.0-4.3). 7.7% of patients undergoing TURP and 22% of patients undergoing open prostatectomy had an adverse event (Table 2).

The most frequent adverse event observed in patients undergoing TURP (n=220) was obstruction of an indwelling urinary catheter due to bladder clots (3.18%). In these patients, hemodynamic instability (2.27%), post-TURP syndrome (1.36%), bladder perforation during TURP (0.9%), hematimetric drop requiring transfusion of packed red blood cells (0, 90%), azotemia (0.90%) and infectious process (0.45%) were observed (Tables 1 and 2).

The most frequent adverse event observed in patients undergoing open prostatectomy (n=59) was a drop in blood count requiring transfusion of packed red blood cells (8.47%). In these patients, hemodynamic instability (3.38%), indwelling urinary catheter obstruction by bladder clots (1.69%), azotemia (3.38%) and infectious process (3.38%) were also observed (Table 2).

DISCUSSION

With the analysis of the data, it is observed that when TURP and open prostatectomy are compared differences in the length of hospital stay and in the frequency of adverse events are found. In addition, when the two groups are compared, there is no difference in the comorbidities presented by the patients.

With the development of endoscopic surgeries, open prostatectomy is being performed less and less, which explains the important difference between the number of patients in each group in this study, with 220 patients undergoing TURP and 59 undergoing open surgery. However, open prostatectomy remains relevant for the treatment of bulky adenomas, which was observed in this study, in which 88.5% of patients undergoing the open technique had a prostate larger than 100 grams^{11,12}.

Table 1. Descriptive analysis of all variables of the study.

Variables	Statistic
Age (years)	68.0 (62.0-73.0)
Chronic anticoagulation?	
Yes	6 (2.2)
No	273 (97.8)
Comorbidities	
Yes	166 (59.5)
No	113 (40.5)
Which?	
Hypertension	144 (86.7)
Diabetes Mellitus	35 (21.1)
Heart disease	20 (12.0)
Urinary tract infections	9 (5.4)
Chronic kidney disease	6 (3.6)
Chronic obstructive pulmonary disease	4 (2.4)
Prostate weight (n=233)	
Less than 70 grams	129 (55.4)
Between 70 and 100 grams	53 (22.7)
More than 100 grams	51 (21.9)
Hospital stay (days)	2.2 (2.0-3.0)
Surgical procedure	
Transurethral resection of the prostate	220 (78.9)
Open prostatectomy	59 (21.1)
Adverse events	
Yes	30 (10.8)
No	249 (89.2)
Which?	
Indwelling bladder catheter obstruction by bladder blood clots	8 (2.8)
Hemodynamic instability	7 (2.5)
Drop of hemoglobin level requiring blood transfusion	7 (2.5)
Azotemia	4 (1.4)
Infectious process	3 (1.0)
Transurethral resection syndrome	3 (1.0)
Bladder perforation during transurethral resection of the prostate	2 (0.7)
Urinary retention after removal of indwelling bladder catheter	2 (0.7)
Delirium	1 (0.3)
Upper gastrointestinal bleeding	1 (0.3)
Desaturation requiring oxygen therapy	1 (0.3)
Anaphylactic reaction	1 (0.3)

As described, patients under code DRG 707 (Major pelvic region surgeries with major complications or comorbidities) and DRG 708 (Major pelvic region surgeries without complications or comorbidities) have an expected

length of stay of 3.1 and 2.2 days, respectively⁶. In this study, patients with or without comorbidity undergoing TURP remained in the hospital for 2.1 days, and patients with or without comorbidity undergoing open prostatectomy

Table 2. Comparison of variables with surgical procedures.

Variables	Surgical Procedure		p-value ^C
	TURP (n=220)	Open prostatectomy (n=59)	
Age (years)	67.5 (61.0 – 73.0)	69.0 (64.5 – 74.5)	0.065 ^M
Chronic anticoagulation?			0.121
Yes	3 (1.4)	3 (5.1)	
No	217 (98.6)	56 (94.9)	
Comorbidities			0.107
Yes	125 (56.8)	41 (69.5)	
No	95 (43.2)	18 (30.5)	
Which?			
Hypertension	107 (48.6)	37 (62.7)	0.076
Diabetes Mellitus	28 (12.7)	7 (11.9)	>0.999
Heart disease	17 (7.7)	3 (5.1)	0.582
Urinary tract infections	7 (3.2)	2 (3.4)	>0.999
Chronic kidney disease	4 (1.8)	2 (3.4)	0.612
Chronic obstructive pulmonary disease	3 (1.4)	1 (1.7)	>0.999
Prostate weight (n=233)			<0.001
Less than 70 grams	129 (71.3)	0 (0.0)	
Between 70 and 100 grams	47 (26.0)	6 (11.5)	
More than 100 grams	5 (2.8)	46 (88.5)	
Hospital stay (days)	2.1 (2.0 – 2.3)	3.1 (3.0 – 4.3)	<0.001 ^M
Adverse events			0.004
Yes	17 (7.7)	13 (22.0)	
No	203 (92.3)	46 (78.0)	
Which?			
Indwelling bladder catheter obstruction by bladder blood clots	7 (3.18)	1 (1.69)	0.096
Hemodynamic instability	5 (2.27)	2 (3.38)	0.445
Drop of hemoglobin level requiring blood transfusion	2 (0.90)	5 (8.47)	0.212
Azotemia	2 (0.90)	2 (3.38)	>0.999
Infectious process	1 (0.45)	2 (3.38)	0.565

Legend: ^Q Chi-square test; ^M Mann-Whitney U test.

remained in the hospital for 3.1 days. Thus, according to the current classification of the DRG, patients undergoing TURP and open prostatectomy are grouped into similar codes, have the same expected length of stay and the same forecast of services to be performed, even if this is not observed in practice.

Regarding postoperative complications, in this study, 7.7% of patients undergoing TURP and 22% of patients undergoing open prostatectomy had some adverse event. In addition to this difference in frequency, which directly impacts the length of stay, the adverse events related to the two procedures are different and, therefore, the services provided and the demand for products will also be different.

In the literature, considering patients undergoing TURP and postoperative complications, 4% have hemorrhage requiring transfusion, 2% post-TURP syndrome, 1% perforations and 6% sepsis⁸⁻¹⁰. The frequency of post-TURP syndrome and perforations found are similar to the literature; however, this study showed lower rates of hematimetric drop with the need for transfusion of concentrated red blood cells (0.9%) and infectious process (0.45%). Regarding patients undergoing open prostatectomy, in the literature, as a postoperative complication, 8.2% required transfusion, 3.3% urinary retention, 8.6% sepsis, 0.4% suprapubic fistula and 3.7% urinary incontinence¹³. The rates of hematimetric drop with the need for transfusion of packed red blood cells are similar to the literature; however, this study showed

lower rates of infectious process (3.38%) and obstruction of the indwelling urinary catheter (SVD) by bladder clots (1.69%). These differences can be explained by the fact that the study was carried out in a single hospital center which functions as a teaching hospital, with well-defined protocols and procedures carried out under the supervision of a trained preceptor.

In order to classify the patient under a DRG code, the main and secondary diagnoses, age and sex, presence of comorbidities, complications and procedures performed are considered. In this study, there is no difference in the comorbidities presented by the patients in the two groups. This equality suggests that comorbidities did not influence the length of hospital stay and adverse events in the study and that the determining factor was the surgical approach, whether endoscopic or open.

The sample number of only 279 patients, which is not a very significant number, can be considered a limiting factor of the study and must be considered when interpreting the observed results. In addition, the fact that this is a retrospective study based on data from medical records can also be considered a limitation.

CONCLUSION

It was concluded that TURP has a shorter hospital stay and a lower frequency of adverse events when compared to open prostatectomy. Therefore, considering that the DRG classification should group patients with similar clinical patterns, we suggest a modification in DRG 707 and 708 so that the endoscopic procedure and open prostate surgery can be included in different codes in the DRG.

AUTHORS' CONTRIBUTIONS

We describe contributions to the papers using the taxonomy (CRediT) provided above: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: Maria Vargas Soares de Sá; Alessandra Cristina Ramos de Carvalho. *Project administration, Supervision & Writing – original draft*: Antônio Peixoto de Lucena Cunha; Maria Vargas Soares de Sá. *Validation & Software*: Gustavo Mayrink Torres. *Data curation & Formal Analysis*: Marcus de Oliveira.

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REFERENCES

- Zerati Filho M, Nardoza Junior A, Reis RB. *Urologia Fundamental*. São Paulo: Planmark; 2010:422.
- Fetter RB. Diagnosis related groups: understanding hospital performance. *Interfaces*. 1991 Fev;21(1):6-26.
- Van Herwaarden S, Wallenburg I, Messelink J, Bal R. Opening the black box of diagnosis-related groups (DRGs): Unpacking the technical remuneration structure of the Dutch DRG system. *Health Econ Policy Law*. 2020 Abr;15(2):196-209.
- Zou K, Li H, Zhou D, Liao Z. The effects of diagnosis-related groups payment on hospital healthcare in China: a systematic review. *BMC Health Serv Res*. 2020 Fev;20(1):112. DOI: <https://doi.org/10.1186/s12913-020-4957-5>.
- Mathauer I, Wittenbecher F. Hospital payment systems based on diagnosis-related groups: experiences in low-and middle-income countries. *Bull World Health Organ*. 2013 Out;91(10):746-56.
- DRG Brasil. *Manual Operacional DRG Brasil*. 2020.
- Danilovic A, Claro JFA. *Excelência e alta complexidade em Urologia*. São Paulo: Dimitris Pappus; 2015:550.
- Amorim AVC, Campos IM, Dias VL, Resende FA, Romanelli DAVL, Garcia CF. Síndrome de ressecção transuretral da próstata. *Rev Med Minas Gerais*. 2017 Dez;27(4):64-70.
- Ishio J, Nakahira J, Sawai T, Inamoto T. Change in serum in serum sodium level predicts clinical manifestations of transurethral resection syndrome: a retrospective review. *BMC Anesthesiol*. 2015 Abr;15(1):50-60.
- Moorthy HK, Philip S. TURP Syndrome: current concepts in the pathophysiology and management. *Indian J Urol*. 2001 Nov;17(2):97-102.
- Campos TJFL. Prostatectomia Transvesical X Prostatectomia a Millin: Revisão de literatura. *Pubsaúde*. 2021 Fev;5:a113. DOI: <https://doi.org/10.31533/pubsaude5.a113>.
- Dall'oglio MF, Srougi, M, Antunes AA, Crippa A, Cury J. An improved technique for controlling bleeding during simple retropubic prostatectomy: a randomized controlled study. *BJU Int*. 2006 Ago;98(2):384-7.
- Seretta V, Morgia G, Fondacaro L, Curto G, Lo Bianco A, Pirritano D, et al. Open prostatectomy for benign prostatic enlargement in southern Europe in the late 1990s: a contemporary series of 1800 interventions. *Urology*. 2002 Out;60(4):623-7. DOI: [https://doi.org/10.1016/s0090-4295\(02\)01860-5](https://doi.org/10.1016/s0090-4295(02)01860-5).



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