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Abdominal compartment syndrome: knowledge of the medical staff of a University Hospital in Curitiba.

Síndrome compartimental abdominal: análise do conhecimento da equipe médica de um Hospital Universitário de Curitiba.

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A B S T R A C T

Objective: to assess the physicians' knowledge regarding intra-abdominal hypertension and abdominal compartment syndrome and to compare it with the established literature. **Methods:** we conducted a descriptive, observational, cross-sectional, quantitative study. We interviewed 38 physicians through a self-administered questionnaire composed of objective questions. We carried out the study in a tertiary reference university hospital, located in Curitiba, Paraná. **Results:** the mean age of the participants was 28 years, 60.5% were female and the mean time of medical experience was 3.5 years. Regarding the knowledge on the subject, 57.9% considered that abdominal compartment syndrome starts with intra-abdominal grade III hypertension, 50% considered abdominal perfusion pressure the most reliable method to determine intra-abdominal hypertension, 89.4% considered the intravesical measuring technique as the most used, 71.1% considered oliguria to be the early sign of abdominal compartment syndrome. Of the interviewees, 81.6% did not measure intra-abdominal pressure because there was no protocol defined by the service. Seventy-nine percent of respondents said they did not know the definitions of the consensus of the World Society of the Abdominal Compartment Syndrome (WSACS). **Conclusion:** half of the physicians were able to classify intra-abdominal hypertension and indicate the onset of abdominal compartment syndrome correctly.

Keywords: Intra-Abdominal Hypertension. Education. Medical. Continuing. Emergency Medicine.

INTRODUCTION

In 1963, Tiennes-Jules Marey, a French physiologist, described the increase in intra-abdominal pressure (IAP) for the first time. However, the term abdominal compartment syndrome (ACS) was only created 26 years later, in 1989, by Fiestsam[1,2]. In 2004, an international group of physicians founded the World Society of the Abdominal Compartment Syndrome (WSACS) to conduct research and comparative studies in the area and to define criteria and protocols/guidelines to improve diagnosis, treatment, prognosis and survival of these patients[3].

ACS is a serious complication due to the extreme and sustained increase in IAP, which is responsible for significant morbidity and mortality, leading to neurological, cardiovascular, pulmonary, renal, hepatic and gastrointestinal adverse clinical manifestations[1,3,4]. The reliable diagnosis of ACS should be performed according to the criteria recommended by the WSACS, by measuring the intravesical pressure with a scale using millimeters of mercury (mmHg)[1,4,5]. The IAP considered normal is in the range of 0mmHg to 12mmHg, but in critically ill patients, it is expected to be between 5mmHg and 7mmHg. Intra-abdominal hypertension (IAH) is defined as a sustained or repeated IAP value ≥12mmHg, and finally, ACS is defined as a sustained or repeated IAP value ≥20mmHg, with or without perfusion pressure <60mmHg, which is associated with dysfunction or organ failure[1,2,4].

The clinical severity and the frequency with which ACS and IAH occur in surgical centers and intensive care units (ICUs) justify a growing number of researches on the topic in the last 15 years[3]. It is important to emphasize that the diagnosis of IAH is frequently unnoticed in

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several hospitals, a fact that is due to the lack of previous knowledge of the definitions, diagnosis and treatment by the professionals, who, in turn, claim that there is no standardized protocol[2,5,6].

The involvement of the medical staff, especially of surgeons and intensivists, is fundamental, since it is a syndrome of great prevalence in surgical patients[2]. Studies indicate that many professionals are still unaware of the definitions related to ACS, indications for treatment and the best course of action to be adopted[2,5,7].

Based on these reflections, and noting that the procedure is not yet fully incorporated into the routine of the medical professionals in the study Service, we defined as the objective of this research to identify the knowledge of the medical staff of a reference center regarding intra-abdominal hypertension and abdominal compartment syndrome and to compare it with the definitions found in the literature.

METHODS

This is a quantitative, descriptive, observational and cross-sectional study about knowledge regarding IAH. We carried out the study in a tertiary university hospital located in Curitiba, Paraná, a State reference in Traumatology. The population of the study comprised resident physicians and specialists in the Surgical, Intensive Care, Emergency and Internal Medicine areas. We performed data collection through a questionnaire prepared for the study, containing 14 objective questions. These included questions about the age and time of professional exercise of the interviewees, as well as specific questions about the classification of the degree of intra-abdominal hypertension as a function of the IAP. We asked about the measurement route and the volume of fluid administered by the catheter when measuring the IAP, as well as the frequency at which it is measured. We also asked about the earliest sign of ACS and the reliability of the variants that determine the degree of perfusion of the abdominal organs. Finally, we questioned why physicians did not measure IAP, as well as their knowledge of the WSCAS consensus.

The study participants individually answered the questionnaires and, afterwards, we compared the answers with the data available in the literature. We collected and stored the data in a Microsoft Excel spreadsheet. We performed the data analysis with the aid of the SPSS v.20.0 software. We expressed the results as means, medians, minimum values, maximum values and standard deviations (quantitative variables) or by frequencies and percentages (qualitative variables).

This work was submitted to, and approved by, the Ethics and Research Committee of the Pontifical Catholic University of Paraná, protocol CAAE 54933516.0.0000.0020, opinion 1,498,051. We respected the ethical aspects regarding confidentiality and adherence to research after signature of an informed consent.

RESULTS

We distributed 53 questionnaires, of which 38 were answered. The average age of the interviewees was 28.7 years, the majority being female (60.5%). The average practice time was 3.6 years. Regarding the training of the interviewees, 24 (63.2%) were resident physicians, 13 of the General Surgery, six of Intensive Care and five of Internal Medicine (Table 1).

Table 1. *Profile of participating professionals (n=38).*

Variable	Number	%
Age (years)		
21-25	4	10.5
26-30	26	68.4
31-35	6	15.8
36-40	2	5.3
Sex		
Female	23	60.5
Male	15	39.5
Professional practice time (years)		
1 to 5	30	78.9
6 to 10	6	15.8
11 to 15	2	5.3
Vocational training		
Residents	24	63.2
Intensive Therapy	4	10.5
Internal Medicine	2	5.3
General Surgery	2	5.3
Preceptor	2	5.3
Emergency specialist	4	10.5
TOTAL	38	100

Grade I IAH was considered as a measured intra-abdominal pressure between 12 and 15 mmHg by 63.2% of the interviewees. Grade II IAH was considered as a measured intra-abdominal pressure between 16 and 20 mmHg by 63.15% of the interviewees. Grade III IAH was considered as a measured intra-abdominal pressure between 21 and 25 mmHg by 55.26% of the interviewees. Finally, grade IV IAH was considered as a measured intra-abdominal pressure >25mmHg by 63.15% of the interviewees (Table 2).

More than half of the interviewees (57.9%) considered ACS to start in grade III IAH (Table 3).

Half of the interviewees considered abdominal perfusion pressure (APP) the most reliable method to determine IAH. The IAP was the second most cited, by almost half of the interviewees (42.1%), followed by lactate (39.5%), arterial pH (42.1%), and lastly, excess base (36.8%) (Figure 1).

Most of the interviewees considered oliguria the earliest sign of ACS (71.05%); the remainder considered this to be metabolic acidosis (10.5%), physical examination (15.79%), or hypoxemia (1.6%).

Regarding the indications for measuring the IAP, more than half of the interviewees (52.6%) chose to measure it only in conditions of risk for ACS; 36.8% chose to measure it after emergency laparotomy; 15.7%, after massive

Table 2. *Classification of intra-abdominal hypertension (n=38).*

Intra-abdominal pressure	IAH grade I	IAH grade II	IAH grade III	IAH grade IV
	N (%)	N (%)	N (%)	N (%)
5-8 mmHg	4 (10.5)	0	0	0
9-11 mmHg	7 (18.4)	3 (7.9)	0	0
12-15 mmHg	24 (63.2)	7 (18.4)	3 (7.9)	0
16-20 mmHg	1 (2.6)	24 (63.2)	6 (15.8)	2 (5.3)
21-25 mmHg	2 (5.3)	1 (2.6)	21 (55.3)	4 (10.5)
25-30 mmHg	0	2 (5.3)	4 (10.5)	2 (5.3)
>25mmHg	0	0	2 (5.3)	1 (2.6)
30-35 mmHg	0	1 (2.6)	2 (5.3)	1 (2.6)
>40mmHg	0	0	0	5 (13.1)

Table 3. *Onset of abdominal compartment syndrome (n=38).*

	N	%
IAH grade I	2	5.3
IAH grade II	8	21
IAH grade III	22	57.9
IAH grade IV	6	15.8
Total	38	100

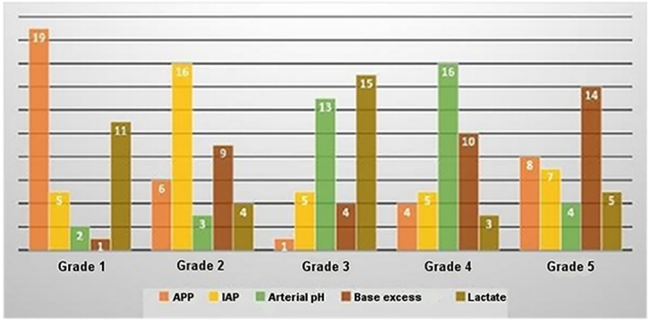

Figure 1. *Order of reliability of the exams as for perfusion of the abdominal organs (nº of responses), with grade 1 being the most reliable and grade 5 being the least reliable*

volume replacement; 7.9%, for all patients on invasive mechanical ventilation; 7.9% would indicate for acute respiratory distress syndrome. Regarding the measuring technique, the majority used the intravesical route (89.4%), while 7.9% used the gastric route and only one interviewee used another unspecified method. As for the frequency of IAP measurement, 34.2% assessed it every two hours; 34.2% of respondents, every four hours; 10.5% of respondents, every hour; and for 13.2% of respondents the frequency of IAP measurement should be based on the patient's clinical data. With regard to the volume of infused fluid, almost half of the interviewees (44.7%) injected 25ml, while 18.4% of the respondents injected 10ml, 26.3%, 50ml and 10.5%, 100ml.

When asked why they did not measured the IAP to assess ACS, the majority of participating physicians (81.6%) answered that they did not measure the IAP because there was no protocol defined by the service; 15.8% never admitted patients with IAH and 7.9% did not assess it for an unspecified reason. Seventy-nine percent of respondents said they were unaware of the WSACS consensus definitions.

The highest number of hits related to the subject was related to the method used to measure the IAP, with 34 (89.9%) correct for intravesical. The second highest number of hits was the earliest sign of ACS, with 27 (71.1%) correct for oliguria. The average accuracy of these five questions was 64.2% (Table 4).

Table 4. *Number and percentage of hits for IAH and ACS compared with the literature (n=38).*

Guideline	Number of correct answers (%)
Intra-abdominal pressure classification*	20 (52.6)
Degree of IAH as onset of ACS	22 (57.9)
Order of reliability to determine IAH **	19 (50)
IAP measurement method	34 (89.9)
Earliest sign of ACS	27 (71.1)

** Considered correct when correctly marked the four degrees of IAH according to WSACS. ** Considered correct only if marked the abdominal perfusion pressure (APP) as the most reliable.*

DISCUSSION

Identifying patients at risk for developing IAH is the initial step to recognize and early diagnose abdominal compartment syndrome[3]. The current recommendation is that the IAP be assessed under the following conditions: A) need for volume resuscitation (shock, large burns); B) increased intra-abdominal content (bulky ascites, hemoperitoneum, acute pancreatitis); C) increased content of hollow viscera (gastroparesis, ileus, pseudo-obstruction); D) sepsis with organic dysfunction; and E) acute respiratory failure, especially when secondary to acute respiratory distress syndrome (ARDS)[5,7,8]. In the hospital studied, more than half of the physicians (52.53%) would indicate IAP measurement only in patients predisposed to develop ACS; 84.22% of the interviewees would not indicate IAP measurement after aggressive volume replacement and 92.11% did not indicate it for ARDS patients. Thus, it is evident that the diagnostic indications for IAH are not widely known, even in a tertiary care institution with a high prevalence of IAH.

The sensitivity of the physical examination to detect IAP elevation has been shown to be very low[9], being the method used as a diagnostic tool by only 15.89% of those interviewed in the current study. On the other hand, oliguria, even in the presence of aggressive volume replacement, is a classic sign of ACS, described by several authors as the first clinical sign to appear with IAH[1]. Most interviewed physicians (71.05%) considered this as the early sign of ACS.

The definitive diagnosis, although clinically suggested, is confirmed only by assessing the IAP, either directly or indirectly[1,9]. Although the measurement of intraperitoneal pressure performed by laparoscopy is considered the gold standard for measuring IAP, intravesical measurement is an effective, simple, low-cost and widely used procedure[10]. This method was initially created in 1984 by Kron, Harman and Nolam and later improved by Cheatam and Safcsak, being the predominant current technique[3,4]. A three-way bladder catheter is connected to a pressure transducer, positioned with the "zero" in the median axillary line. The measurement should then be performed at the end of expiration, with the patient in the supine position, in the absence of abdominal contraction, and after instillation of 25ml of saline solution in the bladder[3,4,10,11].

Recent studies show that infusion volumes of less than 25ml (18.45%) do not significantly alter the results of the IAP. However, volumes higher than those recommended by the WSACS, indicated by 36.8% of the participants, are related to overestimated values of the IAP, which may lead to an inappropriate conducts[2,11,12]. Interestingly, 89.4% of the physicians interviewed would indicate the intravesical measurement method, as recommended by the WSACS. However, less than half of them knew the technical measurement data, such as volume of fluid infused (44.73%), results that resemble those from a study carried out in Portugal[2].

Abdominal hypertension is present when the patient has a sustained IAP greater than or equal to 12mmHg. When reaching this value, it is imperative to classify IAH: Grade I: 12 to 15 mmHg; Grade II: 16 to 20 mmHg; Grade III: 21 to 25 mmHg; Grade IV: >25mmHg[1,2,8,11]. In the current research, we found that 52.6% of physicians are able to classify the IAP according to the WSACS definitions. The correct classification of IAH is important for the definition and diagnosis of ACS, defined as sustained IAP greater than 20mmHg, associated with organic dysfunction, with or without APP<60mmHg. From grade III of IAH (ACS), if there is organic dysfunction, surgical decompression is strongly recommended as part of the treatment to be instituted[8,10,11,13]. In the current study, a portion similar to that which correctly defined the degrees of IAH (52.6%) was able to define the correct pressure of ACS onset.

This attests that just over half of the studied physicians were able to correctly classify IAH after its measurement and indicate the onset of an abdominal compartment syndrome.

Regarding the ideal IAP monitoring frequency, there was no consensus among the interviewees. However, that the vast majority of physicians interviewed preferred repeated measurement in a short period of time: 69% measured every two or four hours, a result that is close to that indicated by the WSACS, according to which monitoring should be performed from four to six hours for patients with IAH[8].

Abdominal perfusion pressure proved to be an excellent method for assessing abdominal organ perfusion[11,14]. In the results found, half correctly considered APP as the most reliable method to determine the perfusion of the abdominal organs. The IAP was considered the second most accurate method for this purpose by nearly half of the interviewees (42.1%). Curiously, lactate, the least accurate method among the five presented, was among the top three for 79% of respondents. The correct order of accuracy - APP, IAP, pH, "base excess" and "lactate"[1] - was described by only five interviewees (13.1%). It is evident that most physicians know the most reliable parameters to determine the perfusion of the abdominal organs (APP and IAP), but they do not know the correct applicability of the others. In the hospital of the current study, the low rate of intra-abdominal pressure measurement, according to the interviewees, is mainly due to the lack of a protocol defined by the service (81%), since none of the physicians considered that the IAP, when indicated, would be a waste of time.

One of the most noteworthy results is the knowledge of the WSACS consensus definitions. Only 21% knew it, a result similar to other studies, one Brazilian[5] (38%) and another Portuguese (28%)[2]. The results showed that more than half of the physicians (52.6%) are familiar with the IAH classifications, as well as the main examinations (50%) and clinical signs (71%) to be used to evaluate abdominal organs' perfusion. In our hospital, knowledge about the IAH classification proposed by the WSACS was shown to be significantly greater than in a similar study in which only 22% correctly defined the 12mmHg pressure as the onset of IAH[2,14]. On the other hand, the IAP measurement technique was only partially known to the interviewees, since the majority correctly indicated the calibration route (89.4%), but a significant portion was unaware of more complex technical data such as volume to be infused (55.2%). Although, in practice, the IAP is checked by the nursing team, the calibration technique, proposed by Cheatam and Safcsak, should be known by physicians, mainly to follow the measurement when the results obtained are not consistent with the patient's clinic.

The most relevant data in the study resides in the indication of IAP measurement. The vast majority of physicians (81%) said they did not assess the IAP because there was no protocol in the hospital under study to be followed. The lack of knowledge of these indications is evident when 90% of the interviewees fail to indicate the measurement in two of the four indications presented to them.

The organic alterations from IAH and ACS have great potential to cause multiple organ failure and, consequently, increase patients' morbidity and mortality. IAH tracing and monitoring conducts would decrease hospital costs and increase patient survival. For this, it is imperative that the indications of monitoring are known by the professionals, as well as the correct method of measuring and classifying IAH, to adopt the correct approach to each case.

In this sense, it is necessary to create a protocol for IAP and diagnosis of IAH for the service under study, as well as to train the professionals and to carry out the correct monitoring of their application. In the present study, slightly more than half of physicians were able to classify intra-abdominal hypertension and, after its measurement, correctly indicate the onset of abdominal compartment syndrome, revealing that the more complex conducts and technical data are known only superficially by the service professionals.

R E S U M O

Objetivo: *identificar o conhecimento dos médicos com relação à hipertensão intra-abdominal e síndrome compartimental abdominal e compará-lo com a conduta estabelecida na literatura.* **Métodos:** *estudo quantitativo descritivo, observacional, transversal. Foram entrevistados 38 médicos por meio de um questionário auto-aplicado composto por perguntas objetivas. O estudo foi realizado em um hospital universitário, de referência terciária, localizado em Curitiba, Paraná.* **Resultados:** *a média de idade dos participantes foi de 28 anos, 60,5% era do sexo feminino e o tempo médio de experiência médica foi de 3,5 anos. Em relação ao conhecimento sobre o tema, 57,9% considerou que a síndrome compartimental abdominal se inicia com a hipertensão intra-abdominal grau III, 50% considerou a pressão de perfusão abdominal o método mais fidedigno para determinar hipertensão intra-abdominal, 89,4% considerou a técnica de aferição intravesical como a mais utilizada, 71,1% considerou a oligúria o sinal precoce de síndrome compartimental abdominal. Não mensurou a pressão intra-abdominal 81,6% dos entrevistados, por não haver protocolo definido pelo serviço. Setenta e nove por cento dos entrevistados afirmou não conhecer as definições do consenso do World Society of the Abdominal Compartment Syndrome (WSACS).* **Conclusão:** *metade dos médicos foi capaz de classificar hipertensão intra-abdominal e indicar o início de um quadro de síndrome compartimental abdominal corretamente.*

Descritores: *Hipertensão Intra-Abdominal. Educação Médica Continuada. Medicina de Emergência.*

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