

APPLICABILITY OF THE DIBH TECHNIQUE IN PATIENTS WITH BREAST CANCER UNDERGOING RADIATION THERAPY

APLICABILIDADE DA TÉCNICA DIBH EM DOENTES COM CANCRO DA MAMA SUBMETIDOS A RADIOTERAPIA

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Abstract

Introduction

Radiotherapy is used to treat breast cancer. The administration of treatment with DIBH makes it possible to remove the organs at risk from the area to be treated. Thus, it is possible to reduce future complications. The lack of respiratory training, anxiety and patient stress are some factors that can compromise the correct execution of apnea, making the treatment more time consuming. The aim of this work is to study the applicability of the DIBH technique in patients undergoing radiation therapy and to create a respiratory training protocol.

Methodology

A bibliographic search was carried out with consultation of databases and digital libraries. A questionnaire was applied to 34 radiotherapy technicians with functions in the treatment unit and CT planning. The questionnaire was released by professional associations and radiotherapy services. Results / Discussion: According to the interviewees and the consulted bibliography, DIBH is mainly applied in the treatment of left breast tumors. It is associated with an increase in treatment time and patient anxiety. According to respondents, anxiety and difficulties initially presented by patients, when performing DIBH, tend to disappear during treatment sessions.

Final considerations

The breathing training session allows the patient to become familiar with the breathing technique. During the training session, the patient should be provided with feedback on his breathing in order to proportionate the improvement of the DIBH. The training should be carried out at home, before the planning CT, as many times as possible.

Key words

Breast Neoplasms (C04.588.180), Radiotherapy (E02.815), DIBH (E02.880),

Introduction

Breast tumor is one of the most common pathologies among women. Radiation therapy after breast-conserving surgery or mastectomy allows for better locoregional control and better long-term survival ⁽¹⁻³⁾

Although radiotherapy allows a decrease in the mortality rate from breast cancer, it is strongly related to the increase in long-term cardiac complications, especially when it comes to the left side, which is why treatment with the DIBH technique is admitted ^(4,5)

Tumors located in the thoracic region are subject to a variation in their position due to respiratory movement ⁽⁶⁾. This change during irradiation results in a geometric uncertainty of dose delivery. In order to ensure that the target volume receives the prescribed dose, the PTV (Planing Target Volume) margins are expanded. However, this expansion results in greater exposure of adjacent risk organs ^(7,8).

As a rule, when patients undergo to the CT (Computed Tomography) planning they do not previously receive any type of respiratory training. Immediately before performing the planning CT, during the calibration of the monitoring system, the patient is explained how to perform a deep inspiration ⁽⁹⁻¹¹⁾

During CT planning and treatment, when the DIBH technique is applied, patients should be able to maintain inspiratory apnea for some time. However, the definition of time varies from author to author and can be between 9 and 30 seconds (12-15). Deep inspiration apnea training, prior to performing the planning CT, allows the patient to improve the depth of inspiration, which, consequently, can translate into a lower volume of irradiated lung and heart ^(16,17).

In addition to the lack of training, there is also the problem of stress and anxiety that patients present during the different stages of treatment. It is known that in situations of anxiety, respiratory characteristics change. Insufficient inspiration leads to the sensation of shortness of breath and

consequent reduced blood oxygenation. These changes can compromise the correct execution of apnea for the necessary time, in the CT planning session and in the treatment ^(13,18,19)

For the present work, the following questions were established:

- Q1:** What is the relationship between the gender of patients undergoing treatment with the DIBH technique and the type of pathology to be treated?
- Q2:** What will be the relationship between the applicability of the DIBH technique with the type of chest pathology, with the laterality of the breast tumor and with the treatment time?
- Q3:** What is the relationship between the treatment time and the patient's ability to maintain apnea and the DIBH technique training time?
- Q4:** What is the relationship between treatment progression and apnea time?
- Q5:** What is the relationship between treatment progression and patient anxiety?
- Q6:** What are the difficulties presented by the patient when undergoing the DIBH technique?
- Q7:** What is the relationship between treatment progression and the difficulties and/or limitations presented by the patient when undergoing the DIBH technique?

In view of the questions raised, the following hypotheses are made:

- H1:** The DIBH technique is mostly applied in the treatment of breast pathology in female patients;
- H2:** When the DIBH technique is applied, there is an increase in the treatment time;
- H3:** The time spent on respiratory training and the patient's inability to maintain apnea advocate an increase in treatment time;
- H4:** Apnea time increases with treatment progression;
- H5:** The patient's anxiety level is higher in the first treatment;
- H6:** With the progression of the treatment sessions, there is a decrease in the patient's anxiety;
- H7:** With the progression of treatment sessions, the difficulty in maintaining apnea for the necessary time, in understanding the instructions provided and/or performing the technique properly tend to decrease.

Materials and Methods

Quiz

A questionnaire was developed by the researchers. The questionnaire aimed to collect information regarding the applicability of the DIBH technique in patients undergoing radiotherapy. The questionnaire was addressed to radiotherapy technicians to perform their work activity in the treatment unit and / or in the CT planning. Initially, the objective of the research was described, the voluntary, confidential and anonymous nature of the participation, as well as the contact of the researchers for further clarification, if necessary. The questionnaire, composed of 4 groups, included questions of multiple choice and open answer. Participants answered questions related to the characterization of patients undergoing radiotherapy treatments, characterization of patients with breast disease, treatment times and apneas performed by patients. The questionnaire was disseminated through social media and the social channels of professional associations and was answered by 34 radiation therapist.

Pilot questionnaire

Before implementing the questionnaire, it is pertinent to test its suitability, consistency and feasibility. Following all the procedures that are intended to be applied in the final investigation process, as a rule, it is applied to 10% of the target population. However, the application to 10 individuals is sufficient to make an overall assessment of the procedure ⁽²²⁾.

Data protection

All elements became aware of the objectives and agreed that their responses were used in this study. The participants of this study during the completion of the questionnaires never had to provide any personal and / or private information, through which they could arrive at their true identity. Only the researchers had access to the answers given to the questionnaire, which is associated with a google email account duly protected with a password. Thus, the participants' total confidentiality and anonymity was ensured.

Main results and discussion

After validation of the pilot study, 34 professionals agreed to participate in the study, taking into account its purpose and objective. The 34 elements included didn't participate in the pilot study.

DIBH in the treatment of breast pathologies

The DIBH technique is widely applied in the treatment of breast cancer. 94.1% of respondents mentioned this pathology as the most frequent. In turn, 5.9% of respondents report pulmonary pathology. The female gender was mentioned by 91.2% of the respondents as the most frequent gender of patients undergoing the DIBH technique. Two of the three respondents who mentioned the male gender, as the most frequent gender of patients, mention the pulmonary pathology as the most treated.

Anxiety of the patient

Patients undergoing radiation therapy often experience some anxiety. With the implementation of the DIBH technique, this feeling can present a greater expression ^(19,20).

Parland et al. investigated the DIBH technique taking into account the patients' perspective, concluding that 49% of the patients included in the study had anxiety on the first day of treatment ⁽²¹⁾. From the point of view of health professionals, in the present study 91.2% reported identifying some anxiety on the first day of treatment. Regarding the moment when anxiety is most noticeable, 87.1% reported it before treatment, 25.8% reported it during treatment and 11.8% mentioned both, before and during. However, all respondents mentioned that this problem tends to disappear with the course of treatment sessions.

In the study by Beaton et al. the patients classified, on a scale from 0 to 10, the level of anxiety when submitted to treatment with respiratory monitoring, taking values of 0.98 ± 1.62 (mean \pm standard deviation). Contrary to the result of this study, Beaton et al. concludes that patients are more anxious at the end of treatment than at any other time ⁽²²⁾.

When performing DIBH, 88.2% of respondents mentioned the existence of positive reinforcement and 97.1% stated the importance of explaining the benefits of the breathing technique to the patient. These results are in agreement with the literature, where it is mentioned that the offer of positive reinforcement, continuous feedback on the DIBH performed and the explanation of the benefits of the technique, in addition to contributing to a potential reduction in the level of anxiety, also promotes an increase in personal initiative^(20,21).

ApneaTime

More than 50% of respondents said it was essential for patients to have the ability to maintain inspiratory apnea for 20 to 30 seconds. This interval is corroborated based on some authors since they refer to a minimum apnea time that is between 20 and 30 seconds, inclusive^(16,23-25). Some authors present the minimum apnea time according to the time required for the acquisition of CT for planning^(16,23,24,26). *Reardon et al.*, mentions that a 15-second interval is applied between each apnea⁽¹⁶⁾.

It would be expected that with the progression of the treatment, with the successive repetitions of the retentions, the patient's apnea time increases, as it happens with the study by *Chi et al.* where the retention time after a first experience / training was significantly longer and all patients were able to maintain apnea for more than 25 seconds⁽²⁷⁾. However, this result is not in line with the result of this study, where 55.9% of respondents reported that the time of apnea tends not to change.

The average number of apneas performed during a treatment mentioned by the majority of respondents was 5 apneas per treatment.

Treatment times

Compared to a free breathing treatment, the time needed to administer the treatment with the DIBH technique increases due to the need for the patient to have multiple apneas and consequent breathing recovery intervals to complete the irradiation, thus increasing the time each patient's stay in the treatment room (28-30). Thus, it is understandable that 73.5% of respondents mention an increase in treatment time, when using the DIBH technique,

taking, according to respondents, between 10 to 15 minutes, without counting the time spent on immobilization and positioning procedures. of the patient.

In the study by *Lee et al.*, compared to the administration of free breathing treatment, the DIBH technique requires more than twice the time, 5 minutes and 10 seconds versus 10 minutes and 30 seconds⁽³¹⁾.

As for the reasons that make the treatment take longer, the inability to maintain apnea and the time spent in respiratory education is the most frequent reason (43.2%), followed by the inability to maintain apnea (37, 8%) and calibration of the monitoring equipment (18.9%).

Table1: Causes of increased treatment time.

Causes of increased treatment time	Answers	
	N	%
Difficulty maintaining apnea	14	37,8
Time used in training the DIBH technique	16	43,2
Calibration of monitoring equipment	7	18,9
Respondents who responded	23	67,6
Respondents who did not respond	11	32,4
Total	34	100

V. Difficulties / Limitations of patients

Approximately 53% of respondents reported that after explaining how to perform the respiratory maneuver, patients are able to perform it easily. However, according to the respondents, patients when submitted to the technique may present some difficulties such as: Difficulty in maintaining apnea for the necessary time (40.7%); Inability to perform apnea properly (46.3%); Misunderstanding of the instructions provided (13%).

Within the mentioned difficulties, only the maintenance of apnea for the necessary time coincided with the difficulties / limitations mentioned by *Testolin et al.* This author also mentions: psychological problems such as claustrophobia anxiety; low reproducibility and stability of breathing; problems related to the language of the patients; problems related to other diseases such as deafness and neurological problems⁽²⁹⁾.

According to *Testolin et al.*, patients with the mentioned limitations cannot undergo the DIBH technique ⁽²⁹⁾. However, in this study, respondents reported that the difficulties were easily overcome with the progression of treatment. In addition, it is also considered that with the prior explanation of the correct way to perform, as well as the benefits of the technique, it contributes so that initially the difficulties may not exist.

Table 2: Patient's difficulties.

Patients' Difficulties	Answers	
	N	%
Understanding The Instructions Provided	7	13
Performing Apnea Correctly	25	46,3
Maintain Apnea For As Long As Necessary	22	40,7
Respondents Who Responded	31	97,1
Respondents Who Did Not Respond	1	2,9
Total	34	100

Respiratory training

Almost all respondents (94.1%) believe that breathing training has done before treatment is beneficial. As for the exact moment when it should happen, Table 3, shown below, illustrates the answers given.

Table 3: Moment of respiratory training.

Breath training moment	Answers	
	N	%
Beginning of the treatment process	2	5,9
Before planning	10	29,4
During planning CT	6	17,6
Between planning CT and treatment	3	8,8
Immediately before treatment	3	8,8
Respondents who responded	24	70,6
Respondents who did not responded	10	29,4
Total	34	100

When asked about the methods they consider important to implement in daily practice in order to improve the breathing technique, 54.2% of the answers refer to breathing training. Table 4, presented below, shows all the methods to be taken into account.

Table 4: Methods to be adopted in daily practice in order to improve the performance of DIBH.

Methods to be adopted in daily practice	Answers	
	N	%
Reinforce training	13	54,2
Proper clothing	1	4,2
Adequate patient selection	1	4,2
Self monitoring	2	8,3
Explanation of the benefits of the DIBH technique	4	16,7
Familiarization of the patient with the equipment	1	4,2
Positive reinforcement	2	8,3
Respondents who responded	16	47,7
Respondents who did not responded	18	52,9
Total	24	100

Chi et al., *Lundgaard et al.*, *Parland et al.* and *Schönecker et al.* they applied the training moments before the CT planning, up to 30 minutes ^(21,23,26,29).

Lundgaard et al. managed that 85% of patients were able to perform the necessary apneas, with great stability for 20 seconds ⁽²³⁾. In the study by *Parland et al.* patients revealed to feel more relaxed and confident when performing the DIBH during treatment, also recommending additional practice outside the clinical environment ⁽²⁵⁾. *Chi et al.* found that patients were able to increase the apnea time by more than 25 seconds ⁽³¹⁾. All patients included in the study by *Schönecker et al.* managed to carry out the planning CT without presenting any difficulty ⁽²⁸⁾.

Like the patients in the study by *Parland et al.* one of the respondents mentioned that it is essential to encourage training patients at home while waiting for the CT planning. Daily practice outside the clinical environment, before CT, has the potential to gradually improve the coordination of the function of the thoraco-abdominal muscle, deepening breathing ⁽¹⁹⁾.

Osnsiri et al. implemented the training a week before the CT planning, complementing it with teaching material. He concluded that, under these conditions, it might be possible to halve the time spent on performing the CT, 22.3min versus 10.3min ⁽²⁰⁾. Also almost a week in advance of CT planning, *Kim et al.* concluded that apnea can be improved allowing a reduction in the average cardiac dose and in the cardiac volume that receives 5 Gy and 10 Gy (V_5 and V_{10}) ⁽¹¹⁾.

Oonsiri *et al.* provided instructions through a leaflet and / or videos to patients undergoing the technique, with no significant difference between these two types of materials. The provision of teaching materials allows to reduce the workload of technicians, increasing the number of patients undergoing CT ⁽²⁹⁾.

Conclusion

Through the answers obtained in the questionnaire, it is possible to verify that the DIBH technique is widely used in female patients, in the treatment of breast pathologies, especially when located on the left side.

With the application of this treatment technique, the treatment time tends to increase due to the time spent on respiratory training and due to the patient's inability to maintain apnea for the necessary time.

With the progression of treatment, and contrary to what is reported in the literature, respondents report that patients' apnea time does not tend to undergo any change in terms of duration.

The beginning of treatment causes greater anxiety on the part of the patient, which tends to cease to exist as the treatment sessions progress.

According to the perception of the professionals surveyed, the greatest difficulty for patients is that they are unable to perform inspiratory apnea properly, as well as maintaining it for the necessary time. However, these difficulties tend to decrease as treatment sessions progress.

Taking into account the results obtained through the questionnaire, it is possible to infer that respiratory training can be applied 1 week in advance of the planning CT.

The training session aims to increase the patient's adherence to the technique, explain the main benefit of DIBH as well as the correct way to perform it.

Then, in the treatment position and with the respective immobilization accessories, with the monitoring equipment to be used during the

treatment, the patient must first contact the breathing technique. You should train as many sets of 5 apneas as possible, in deep inspiration, with a minimum duration of 20 seconds and 15 seconds apart.

The patient should be provided with feedback on his breathing so that he is aware of its stability and can improve it.

The general and specific objectives of this study were achieved. It was possible to study the applicability of the technique and thus create a respiratory training protocol.

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