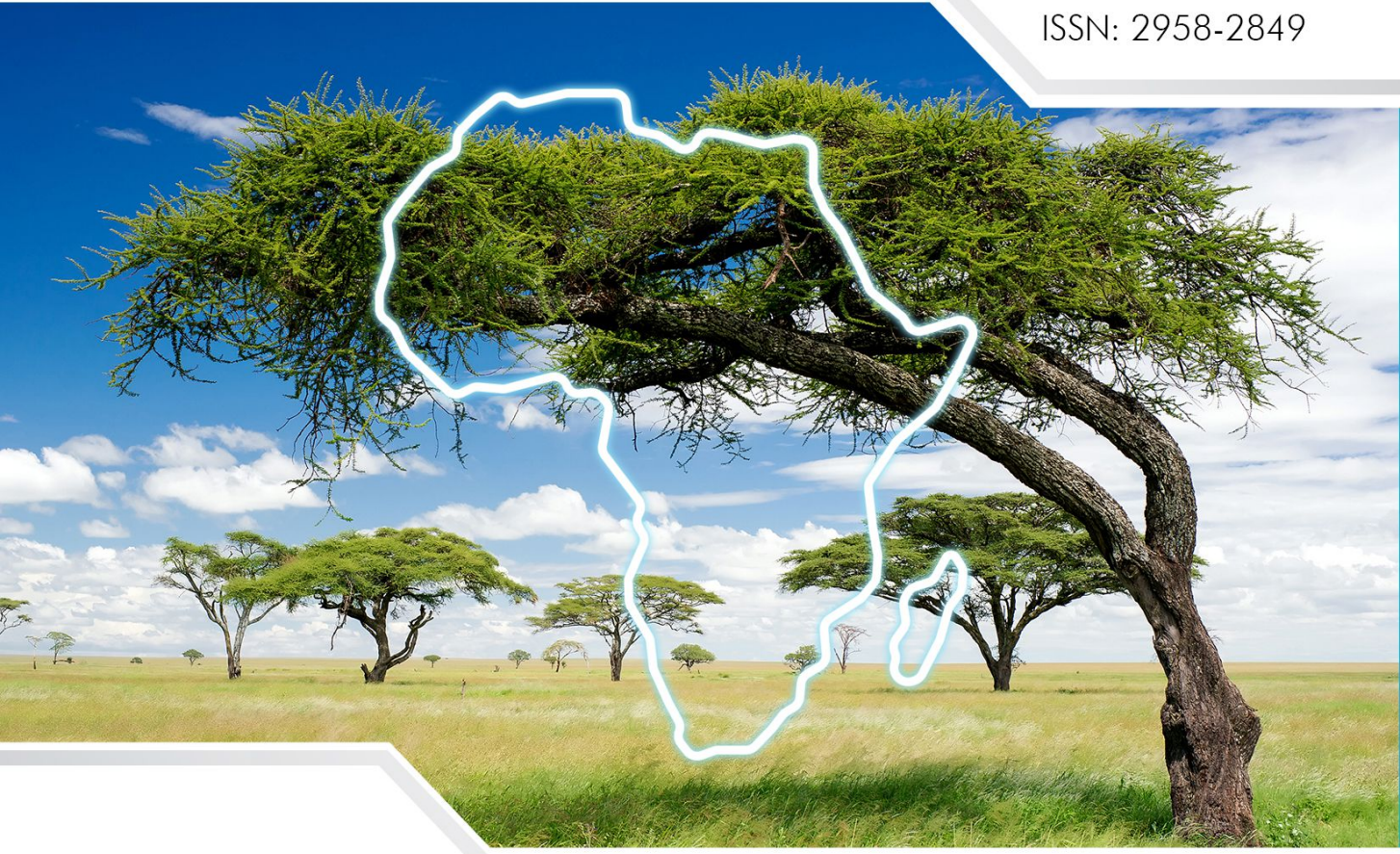


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Evaluation of COVID-19 Vaccination Rate in Healthcare Workers in a Tertiary Hospital in Mogadishu Somalia: A Cross-sectional Study

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Abstract **Introduction:** The percentage of healthcare workers vaccinated against COVID-19 in Somalia remains unknown. Our study's primary aim is to determine the COVID-19 vaccination rate among healthcare workers in a tertiary hospital in Mogadishu, Somalia.

Materials and Methods: This questionnaire-based cross-sectional was conducted between September 1st and September 20th, 2021.

Results: A total of 210 healthcare workers were included. Among 210 healthcare workers enrolled in the study, 56.2% (n=118) were male. Most (53.8%, n=113) participants were aged between 18 and 27. Most (48.6%, n=102) of all participants were physicians. The COVID-19 vaccination rate of the healthcare workers in Somalia Turkiye Training and Research Hospital was 20% (n=42). Males had a significantly higher vaccination rate than females (26.2 vs. 12%, $p<0.05$). The most common reasons for not getting vaccinated were fear of potential complications and believing that vaccination would not be protective against the disease.

Conclusions: Most healthcare workers were hesitant to be vaccinated despite the availability of the vaccine. This approach exposes physicians and allied health workers to a significant risk of COVID-19. It also obstructs the fight against COVID-19.

Keywords COVID-19 vaccination rate, COVID-19, Healthcare workers, Somalia.

Introduction:

When the coronavirus disease (COVID-19) was discovered in late 2019, it did not only become a significant global health burden, but it also became an economic and social burden all over the world (1). In many countries, the COVID-19 vaccine was approved for the general population at the end of 2020 and early 2021(2, 3). The COVID-19 vaccines were evaluated through many clinical trials and demonstrated a high level of protection against the virus (1). Due to their profession and daily life work, healthcare workers (HCWs) are one of the most prone population groups to contracting SARS-CoV-2 infection, thus developing COVID-19 (4). Hence, HCWs were identified as one of the priority groups to receive the vaccine worldwide (5). Despite these efforts from the governments and institutions to vaccinate HCWs, the acceptance rate of COVID-19 vaccination among HCWs is relatively low. For instance, a poll that the Kaiser Family Foundation arranged in December 2020 found that 29% of the HCWs were hesitant to get the COVID-19 vaccines, while 27% of the individuals in the general population did not want to get vaccinated (3,6). Biswas and coworkers found that more than 75,000 healthcare professionals worldwide estimated that more than a fifth of the healthcare workers globally was hesitant to vaccinate (3,7). In Somalia, the ministry of health reported its first confirmed COVID-19 case in mid-March 2020. In early March 2021, the first doses of the COVID-19 vaccine arrived in Somalia through the COVAX facility. Therefore, the Somali government rushed to vaccinate frontline HCWs and those with the highest risk (8). The government has given at least 8,134,037 COVID-19 vaccine shots

during this study (9). However, the percentage of HCWs vaccinated against COVID-19 in Somalia Turkiye Training and Research Hospital remains unknown. The primary purpose of our study is to determine the COVID-19 vaccination rate among healthcare workers in a tertiary hospital in Mogadishu, Somalia. This study will also investigate why healthcare workers in Somalia are hesitant to get vaccinated.

Materials and Methods

This study is a single-center, cross-sectional cohort conducted between September 1st, 2021, and September 20th, 2021, at the Somalia Turkiye Training and Research Hospital. The hospital is a tertiary care facility and the largest hospital in Somalia (10), with all health departments, and it serves at least 1,000 patients per day. More than 1,000 healthcare workers are currently employed in the facility. Informed consent was obtained from every healthcare worker that participated in this study. This study does not reveal any personal data about the participants, and the participants' privacy was well protected. This study has been evaluated and approved by the Somalia Turkiye Training and Research Hospital ethical committee board.

The study participants were 210 healthcare workers from the Somalia Turkiye Training and Research Hospital who consented to participate. The healthcare workers who refused to participate were excluded from this study. The COVID-19 vaccines that Somalia Turkiye Training and Research Hospital healthcare workers received were the Oxford AstraZeneca vaccine and the Sinopharm COVID-19 vaccine.

A questionnaire created in Google Forms was used to collect the data. Every healthcare worker at the Somalia Turkiye Training and Research Hospital received a message including a link to the Google form quiz via an online platform. However, some healthcare personnel could not be

reached online; thus, a written version of the same questionnaire was gathered via a face-to-face interview by one of our investigators to guarantee the data's accuracy.

The questionnaire consisted of three sections, the first covering the participants' demographic information. The demographic information obtained from this questionnaire includes the participants' age, sex, and occupation. If the respondent indicated that he or she was a physician, the next question inquired about the participant's department. The second section of the questionnaire inquired about the participant's status of COVID-19 immunization. It also includes questions on the respondent's reasons for not receiving the vaccine if they are unvaccinated. The final section of the questionnaire included items that could only be answered by vaccinated individuals. It comprises questions addressing whether the participant experienced any issues after receiving the COVID-19 vaccination, regardless of the type of vaccine administered.

The information obtained via Google Forms and paper questionnaires was conveyed to a Microsoft Excel document and subsequently imported to version 26 of Statistical Package for the Social Sciences (SPSS) software. The data was eventually analyzed using version 26 of the Statistical Package for the Social Sciences (SPSS) program. In this study, descriptive statistics and mean comparisons were utilized. The data were shown as frequencies and percentages.

Results:

Among the 210 healthcare workers enrolled in the study, 56.2% (n=118) were male, and 43.8 (n=92) were female. In addition, the participants were divided into different age groups. Most (53.8%, n=113) of the patients were aged between 18 and 27. The second most common age group in the study was 28–35 years (42.9%, n=90), and it was followed by the 36–50 years (3.3%, n=7) age group (Table 1).

Approximately half (48.6%, n=102) of the participants were physicians. Nurses accounted for 33.8% (n=71) of the participants, followed by radiology technicians, anesthesia technicians, and laboratory personnel with 6.7% (n=14), 6.2% (n=13), and 4.8% (n=10), respectively (Table 1).

The Covid-19 vaccination rate among healthcare professionals at the Somalia Turkiye Training and Research Hospital was 20% (n=42). The remaining 80% (n=168) were not immunized against the virus. The vaccination rate was more common in males than females (26.2% vs. 12%, p=0.01) (Table 1).

Table 1: Descriptive analysis results of vaccination level according to demographic variables

Age	Vaccinated	Non-vaccinated	% Of Vaccinated	Total HCW	<i>P Value</i>
18-27 years	13	100	11.5	113	
28-35 years	26	64	29	90	
36-50 years	3	4	43	7	
Sex					
Male	31	87	26.2	118	<0.01**
Female	11	81	12	92	
Profession					
Doctor	31	71	30	102	<0.18
Nurse	4	67	5.6	71	
Radiology technician	2	12	14.2	14	
Anesthesia technician	4	9	30.7	13	
Laboratory staff	1	9	10	10	
Total					
	42	168	20	210	

Vaccination rates were 30% (n=31), 5.6% (n=4), 14.2% (n=14), 30.7% (n=4), and 10% (n=1) among physicians, nurses, radiology technicians, anesthesia technicians, and laboratory personnel, respectively. No significant correlation existed between SARS-CoV-2 vaccination and the participants' profession (p=0.18) (Table 1). Among 210 individuals, 80% (n=168) were not

vaccinated against COVID-19 disease. Among these 168 participants, 58% (n=97) reported fear of vaccination effects as their primary reason for not receiving the vaccine. On the other hand, 23% (n=39) believed they would not benefit from vaccination, while 8.3% (n=14) reported that they could not receive a vaccination due to reasons beyond their control. In addition, 9% (n=15) stated no apparent reason, and 1.7% (n=3) noted that they avoided the vaccination due to religious or cultural reasons (Table 2).

Table:2. Reasons of not getting SARS-CoV-2 vaccine for unvaccinated participants

Age	I did not get the opportunity		I do not think it will be beneficial to me		I am afraid of its complications		I do not want to take vaccine due to religious or social reasons		No reason	
	n ()	%	n ()	%	n ()	%	n ()	%	n ()	%
18-27 years	(9)	9	(20)	20	(61)	61	(3)	3	(7)	7
28-35 years	(5)	7.8	(18)	28	(33)	51.52	(0)	0	(8)	12.5
36-50 years	(0)	0	(1)	25	(3)	75	(0)	0	(0)	0
Sex										
Male	(7)	8	(22)	25.2	(46)	53	(1)	1.1	(11)	12.6
Female	(7)	8.6	(17)	21	(51)	63	(2)	2.4	(4)	5
Profession										
Doctor	(8)	11	(21)	30	(34)	48	(1)	1	(7)	10
Nurse	(3)	4.4	(13)	19.4	(46)	69	(0)	0	(5)	7.4
Radiology technician	(1)	8.3	(2)	16.7	(5)	41.6	(1)	8.3	(3)	25
Anesthesia technician	(1)	11.1	(1)	11.1	(6)	66.6	(1)	11.1	(0)	0
Laboratory stuff	(1)	11.1	(2)	22.2	(6)	66.6	(0)	0	(0)	0
Total	(14)	8.3	(39)	23	(97)	58	(3)	1.7	(15)	9

Regardless of the type of COVID-19 vaccine received, 42.8% (n=18) of the 42 participants who have received SARS-CoV-2 immunization experienced adverse effects. Seventy-eight percent (n=14) of the individuals reported experiencing fever. While 72.2% (n=13) of those vaccinated reported body aches, 44.4% (n=8) complained about discomfort at the injection site. None of our participants experienced thrombosis or any other significant complications due to the vaccination (Table 3).

Table:3. This table summarizes the complications that vaccinated participants experienced regardless the type of vaccine

Variable	n Sample size	%
Fever	14	78
Body ache	13	72.2
Pain at the site of injection	8	44.4

Discussion:

The novel coronavirus infection 2019 (COVID-19) has been ongoing and infecting numerous people affecting their daily life in the process (11, 12). Hence, this situation sparked the most extensive vaccine hunt in the history of medicine (13, 14). Many studies about the COVID-19 vaccine have been done worldwide to ensure its safety and demonstrate its potential side effects. Vilches and colleagues reported that the vaccine could decrease the number of people infected by the virus and thus decrease the morbidity and mortality of the COVID-19 disease (11).

Some regions of the world have a higher acceptability rate of COVID-19 vaccination than others. For instance, in Vietnam, a study done by Huynh et al. in 2021 about the willingness of healthcare

workers to get SARS-CoV-2 vaccination concluded that 76% of HCWs were willing to get vaccinated (15). Another example is a cross-sectional study done in France by Gagneux-Brunon et al. in 2021, which assessed the intentions of HCWs to get vaccinated against COVID-19. They found that the intention to get the vaccination was as high as 75% (16).

In 2021, a study that enrolled 500 participants and conducted by Mohamud and coworkers worked on the COVID-19 vaccine acceptance rate in the general population in Mogadishu, Somalia (17). They concluded that most participants (63.2%) refused to take the vaccine. However, another study from Somalia by Ahmed and colleagues analyzed the data of 4543 participants and reported a high rate of the general population accepted to receive the COVID-19 vaccination (18).

In the present study, we found the COVID-19 vaccination rate among healthcare workers in Somalia Turkiye Training and Research Hospital as 20%. Furthermore, our study suggested that gender was a significant positive predictor of getting the vaccination, as the vaccination rate among males was significantly higher than among females. This relationship between gender and vaccination was also supported by a meta-analysis by Biswas and coworkers, which found that males were more likely to accept COVID-19 vaccination than females (3).

Our study also found that 30% of the physicians working in Somalia Turkiye Training and Research Hospital were vaccinated. However, the vaccination rate was much lower among nurses (5.6%). This fact exposes the nurses to significant risk as they are in close contact with the patients. Of note, our study did not show any association between the participants' profession and being vaccinated against COVID-19 disease.

In our study, the most common reason for not getting vaccinated was the fear of the vaccines' potential complications. Also, 23% of the participants believed that the vaccine would not protect

them from COVID-19 disease. This finding aligns with those reported by Biswas et al. in 2021 (3).

In our cohort, generalized body aches and pain at the injection site were the most common adverse effects of the vaccination. This finding is also consistent with the literature (3).

There are some limitations of our study. First, it has a small sample size. Second, it is a single-center study. However, its findings are significant since our center is the only tertiary care center in Somalia.

Conclusion

Only 20% of the healthcare workers in the only tertiary care hospital of Somalia are vaccinated against COVID-19 disease. Most healthcare workers were hesitant to be vaccinated despite the availability of the vaccine. This approach exposes physicians and allied health workers to a significant risk of COVID-19. It also obstructs the fight against COVID-19.

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Disclosure

The authors declare no competing interests.

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Incarcerated Inguinal Bladder Hernia: Case Report

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Abstract The incidence of urinary bladder hernia accompanying inguinal hernias is 1-4%. Herniation of the urinary bladder into the inguinal canal and scrotum can cause urinary retention and hydronephrosis, bladder necrosis, and renal dysfunction. This study presents a case that underwent emergency surgery for an incarcerated inguinal hernia. The hernia sac included the urinary bladder in addition to bowel segments. An attempt to save the ischemic bladder wall during partial bowel resection failed, and the patient developed a vesicocutaneous fistula. The fistula was repaired, and the ischemic bladder wall was resected. During the repair of an inguinal hernia, general surgeons and urologists must be aware of this rare condition and work together in terms of patient management. Although the bladder-sparing approach can be performed in cases without signs of severe bladder ischemia, patients should be followed closely for complications related to ischemia.

keywords Urinary bladder hernia, Herniorrhaphy, Inguinal Hernia, Vesicocutaneous Fistula

Introduction

Inguinal bladder hernia is a rare clinical condition that Levine described in 1951 as a 'scrotal cystocele' (1). The incidence of bladder hernia accompanying inguinal hernias is 1-4% (2). Most cases are

asymptomatic. Approximately 7% of these patients have signs and symptoms such as difficulty in urinating, pain, and scrotal swelling, which decreases after voiding. Herniation of the urinary bladder into the inguinal canal and scrotum can cause urinary retention and hydronephrosis, bladder necrosis, and renal dysfunction (3). If a bladder hernia is suspected preoperatively, ultrasonography, computed tomography, and magnetic resonance imaging can be performed. However, cystography is the most sensitive imaging method for diagnosing inguinal bladder herniation (4). In this study, we presented a case that underwent emergency surgery for an incarcerated inguinal hernia associated with a urinary bladder hernia.

Case Presentation

A 63-year-old male patient presented to the emergency department with nausea, vomiting, difficulty urinating, and abdominal pain. The patient did not pass stool for three days and had right hemiscrotal swelling for the last week. The patient had type-2 diabetes mellitus disease and no history of surgery. The vital signs were stable. Physical examination revealed an obese (i.e., body mass index: 31 kg/m²) patient with an irreducible inguinal hernia on the right side. There were also diffuse distention and tenderness in the abdomen. The laboratory examination results were unremarkable. An abdominopelvic computed tomography revealed a right inguinal hernia sac, including the urinary bladder wall and bowel loops (Figure 1).

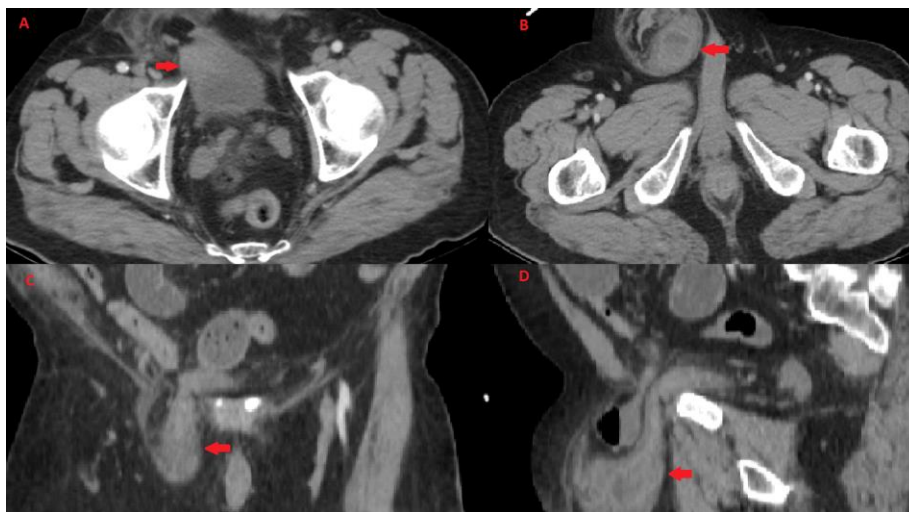


Figure 1. Preoperative computed tomography sections. **1A:** Bladder herniated into the inguinal canal in transverse view. **1B:** Bladder and bowel loops herniated into the inguinal canal in computed tomography transverse view. **1C:** Bladder herniated into the inguinal canal in computed tomography coronal view. **1D:** Bladder and bowel loops herniated into the inguinal canal in sagittal view.

There was no dilatation in the pyelocalcical system. The general surgery team decided to proceed with emergent inguinal exploration. The surgery started with an inguinal incision, and the exploration revealed an inguinal hernia sac, including a 10 cm, irreducible bowel segment along with the urinary bladder (**Figure 2**).

The urology team was consulted intraoperatively, and a median infraumbilical incision was performed. Further exploration revealed herniation of a 10 cm, severely ischemic bowel segment 70 cm proximal to the ileocecal valve. The bladder wall had an ischemic appearance. The severely ischemic bowel segment was resected, and the remaining bowel segments were anastomosed in an end-to-end fashion. The internal ring was expanded, and the herniated, ischemic bladder was reduced to the intraperitoneal space. It was observed that the ischemic area extending from the anterior wall of the bladder to the lateral walls partially improved after reduction.

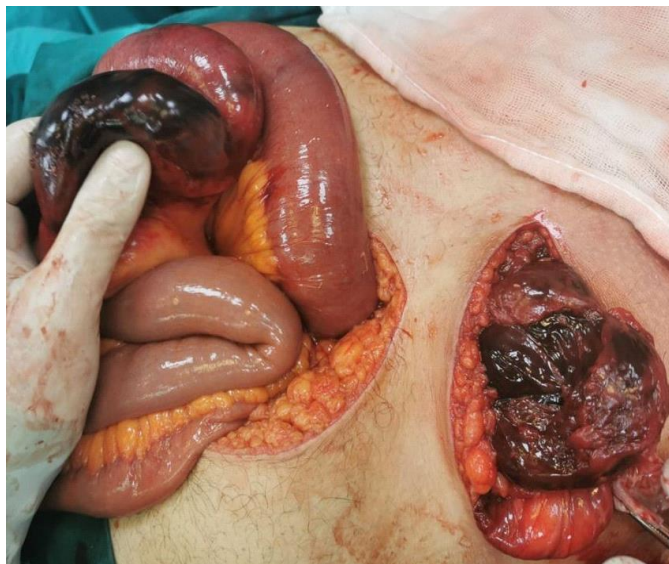


Figure 2. Intraoperative image of the bladder and intestinal loop after reduction

A 20F foley catheter was inserted, and the bladder was distended with the administration of 300 cc saline. A bladder perforation was ruled out. The fascia defect starting from the internal ring, was repaired. This repair was performed without a mesh at the suggestion of the urology team. Two rubber tube drains were placed, one into the intraperitoneal space and one into the prevesical space. After referral to the inpatient floor, the patient was followed up with a Foley catheter. His urea, creatinine, and urine output were all in the normal range. The patient was discharged on the seventh postoperative day after removing the drains. The patient's Foley catheter was removed on the tenth postoperative day. As previously scheduled, the patient presented to the urology outpatient clinic two weeks after discharge. There were complaints of

frequent urination and a leak from the surgical incision site. A fistula was suspected, and therefore, a cystogram was performed. The cystogram revealed a vesicocutaneous fistula (**Figure 3**).

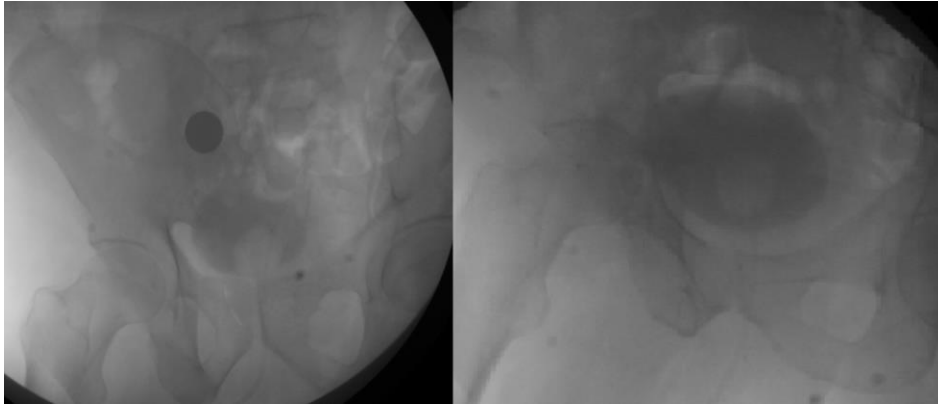


Figure 3. Extravasation from the anterior of the bladder in the cystogram

The patient was re-admitted, and a Foley catheter was placed. The urine leak was followed for one week; however, it persisted. A fistulectomy was planned. During exploration, a perforation area with a diameter of 1.5 cm and a vesicocutaneous fistula stemming from the anterior wall of the bladder were detected (**Figure 4**).



Figure 4. Fistula stemming from the anterior wall of the urinary bladder and the perforation site

Necrotic tissues in the bladder wall were debrided. At this stage, approximately 1/3 of the anterior wall of the bladder was excised along with the vesicocutaneous fistula. The bladder was repaired in a water-tight fashion. Administration of 200 ml of normal saline into the bladder did not reveal any urine leak. A tube drain was placed into the perivesical area. The postoperative period was uneventful. The patient was

discharged on the third postoperative day after removing the drain. The Foley catheter was removed on the 10th postoperative day.

No extravasation was observed on the cystourethrogram performed after the postoperative first month (**Figure 5**).



Figure 5. Cystogram performed after fistulectomy surgery

Bladder capacity was measured as approximately 250 ml. The patient developed storage symptoms such as frequent urination and nocturia without any obstructive voiding symptoms. Therefore, an anticholinergic (i.e., tolterodine 4 mg tablet, 1x1) medical treatment was initiated. The storage symptoms improved with this treatment without any deterioration in kidney function.

Discussion

Inguinal hernia of the bladder or scrotal cystocele is a rare condition (**5**). It is detected in 0.5-5% of all inguinal hernia cases. The most common risk factors are high body mass index (i.e., $>30 \text{ kg/m}^2$), previous pelvic surgery, and bladder outlet obstruction. It is usually diagnosed in men over 50 and on the right side (**6**). Most cases are asymptomatic and are detected incidentally on radiological imaging or during inguinal hernia repair. Most symptomatic patients have symptoms such as increased voiding frequency, dysuria, and decreased scrotal swelling after voiding (i.e., Mery's sign). In addition, it is associated with prostatic hypertrophy and cystitis in most patients (**2,7**).

If bladder herniation is suspected in a patient, it is suggested that imaging studies such as ultrasonography, computed tomography, or magnetic resonance imaging can be performed (**2,7**). These studies can also

demonstrate the upper urinary tract, prostate, and inguinal region. However, cystography is the most sensitive imaging modality for diagnosing inguinal bladder herniation (4).

It was reported that 77% of inguinal bladder herniations were diagnosed intraoperatively, 7% were detected preoperatively, and 16% were diagnosed during the management of postoperative complications (3,7). Open surgical repair is the preferred treatment method. Surgical technique depends on surgeon preference. Inguinal hernia can be repaired with or without mesh. The most critical aspect of the surgery is the definition of the anatomical content of the inguinal hernia sac. It was reported that the risk of urinary bladder injury could be as high as 12% in cases with preoperatively missed inguinal bladder herniation (7). Also, it was claimed that the rate of bladder injury significantly decreased when bladder herniation was noticed preoperatively (3,7).

Massive incarcerated inguinal bladder herniation is extremely rare. Recognition of inguinal bladder herniation before or during the hernia surgery prevents complications such as hematuria, sepsis, and ureteral injuries in addition to bladder injuries (8). The presence of necrosis, tumor, and diverticulum in the herniated bladder are indications for resection. A midline approach is required to prevent ureteral damage if resection is performed. If an extensive resection is performed, elective bladder augmentation can be planned. The reduction procedure is preferred if resection is not required. In our case, we preferred reduction since there was no necrosis in the bladder wall and the ischemia findings partially subsided during exploration.

Although there was no obstructive uropathy in our case, it was noted that some patients developed upper urinary tract obstruction due to inguinal bladder herniation (4,9,10). In a study about inguinal bladder hernia, Hellerstein et al. denoted that they repaired the inguinal hernia without using a mesh (Bassini technique), and no complications occurred during follow-up (10). They also noted that kidney functions should be evaluated in these patients. If it is necessary, upper urinary tract imaging should be performed in these patients. In line with this suggestion, we assessed the kidney function in our case and showed that it was normal during the preoperative and postoperative periods.

Huerta et al. and Ansari et al. reported that patients with inguinal bladder herniation might also present with macroscopic hematuria (11,12). However, these authors did not find bladder mucosa damage during the cystoscopies of their cases. Also, urinary system imaging did not reveal any finding, such as a stone or tumor, that could cause hematuria. Hernia repair was performed using mesh in both cases, and no bowel or bladder resection was required. Ansari et al. stated that macroscopic hematuria might have occurred due to high intraluminal pressure resulting from urinary retention (11). In our case, there was no hematuria and no urinary retention.

Vindlacheruvu et al. detected incarcerated inguinal bladder herniation in a 79-year-old male patient with right hemiscrotal pain, bowel obstruction, and lower urinary tract symptoms (8). Subtotal cystectomy was

performed due to massive infarction, and a necrotic 5-cm ileum segment was resected. These authors stated that the patient's bladder capacity was 200 milliliters postoperatively. In our case, 1/3 of the anterior wall of the bladder was excised during vesicocutaneous fistula excision, and the bladder capacity was calculated as approximately 250 ml. The patient's lower urinary tract symptoms improved with anticholinergic therapy. In their study, Vindlacheruvu et al. did not give any details regarding how they managed their patient's low bladder capacity.

Helleman et al. presented a 64-year-old man diagnosed with an incarcerated inguinal hernia after complaining of pollakiuria, nocturia, increased pre-existing left hemiscrotal swelling, and left inguinal pain (13). In this case, the bladder fundus was detected in the hernia sac. A portion of the herniated bladder fundus was excised, and hernia repair was performed without bowel excision. These authors stated that no complications occurred during the 6-month follow-up, and the patient's low urinary tract symptoms improved. They also noted that they preferred hernia repair without mesh due to the risk of urinary tract infection, urine leak, and subsequent mesh infection in these cases. In our case, bladder wall excision was not performed during the initial exploration since the bladder walls were not severely ischemic. However, an excision had to be performed after the development of a vesicocutaneous fistula. Since there was no mesh, we did not face any mesh-related complications before and after vesicocutaneous fistula repair and partial bladder resection.

Conclusion

Bladder herniation should be suspected, especially in cases of inguinal hernia accompanied by urinary system tract symptoms. Preoperative diagnosis of bladder herniation can reduce intraoperative and postoperative complication rates. During the repair of an inguinal hernia, general surgeons and urologists must be aware of this rare condition and work together in terms of patient management. Although the bladder-sparing approach can be performed in cases without signs of severe bladder ischemia, patients should be followed closely for complications related to ischemia, such as vesicocutaneous fistula. On the other hand, patients should be informed about the potential need for anticholinergic treatments and bladder augmentation surgeries if an extensive bladder resection is performed.

Consent

Written informed consent was obtained from the patient to publish this case report and accompanying images.

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Central Neurocytoma Presenting with Progressive Headache: A Case Report and Literature Review

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Abstract Central neurocytoma (CN) is a rare benign brain tumor primarily diagnosed in young patients. It mainly occupies the lateral ventricle and has relatively characteristic imaging features that aid in its diagnosis. This tumor causes obstructive hydrocephalus and manifests with signs of increased intracranial pressure. Herein, we present a case of a 53-year-old female diabetic patient who presented to our neurology clinic with an eight-month history of diffuse progressive headaches. Her headache was associated with nausea but not vomiting. There was no motor or sensory deficits or paresthesia. Likewise, the examination revealed no diplopia, ophthalmoparesis, cranial nerve impairments, or papilledema. Magnetic resonance imaging (MRI) of the brain revealed a heterogeneous intraventricular mass measuring 45x41 mm in size with surrounding mild tissue edema, typical for a central neurocytoma. The patient was referred to the neurosurgery department for surgical removal of the tumor; however, the patient did not consent to surgery. Brain MRI should be done in young patients with a headache that does not have the characteristics of primary headaches.

Keywords Central neurocytoma, Brain tumor, Progressive headache.

Introduction

Central neurocytoma is an uncommon intraventricular benign central nervous system neoplasm that accounts for 0.25–0.5% of primary brain tumors. It is relatively more common in younger patients; 70% of the cases are diagnosed between the ages of 20 and 40 (1). Although some of these tumors have been

reported to be located in the third and fourth ventricles, most are located in the anterior portion of the lateral ventricle. In addition, the tumor is often connected to the septum pellucidum at the foramen of Monroe (2). Central neurocytoma can elevate intracranial pressure and thus induce hydrocephalus. Nausea, vomiting, headaches, seizures, loss of consciousness, weakness, and memory or vision impairment are all possible symptoms or signs. However, the duration of symptoms appears to be primarily related to the tumor location rather than the tumor's aggressiveness (3). The diagnosis is made through brain MRI, but the definitive diagnosis is made by histopathology (4).

Here, we report a patient with lateral ventricle neurocytoma (a rare brain tumor) presenting with a chronic progressive, moderately severe headache with no other associated neurologic deficit.

Case Presentation

A 53-year-old female diabetic patient came to the neurology clinic with an eight-month history of diffuse and progressive headaches. The headache was more on the vertex and was of moderate intensity. It was associated with nausea but not vomiting. There were no associated photophobia, phonophobia, or change in the headache in different head positions.

The patient did not have a family history of brain tumors. The patient had no paresthesia or motor or sensory impairments upon neurologic assessment. The examination revealed no signs of diplopia, ophthalmoparesis, or cranial nerve impairments. The fundus examination revealed no associated papilledema, and the rest of the neurologic examinations were unremarkable.

Brain MRI revealed a heterogeneous intraventricular mass lesion 45x41 mm in size and surrounding mild tissue edema, making a compression effect on the right lateral ventricle (**Figures 1-4**). The location and signal characteristics of the lesion were consistent with central neurocytoma. Unfortunately, histopathology and MRI spectroscopy could not be performed due to a lack of availability. The patient was referred to the neurosurgery department for surgical treatment. Surgical removal was recommended; however, the patient did not consent to surgery.

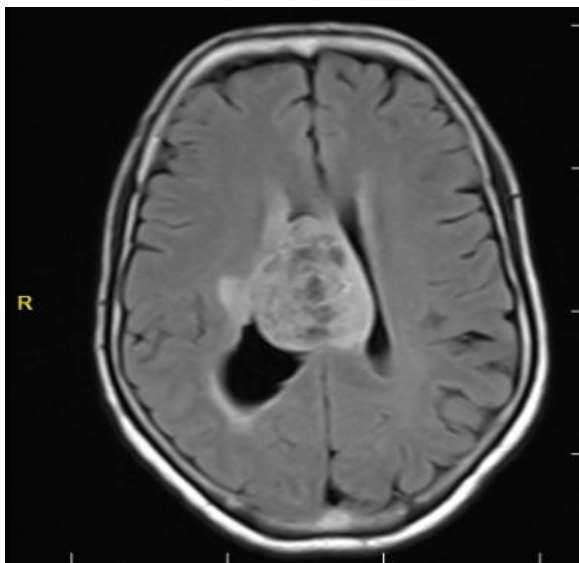


Fig.1. Brain MRI Axial Flair view, showing hyperintense heterogeneous intraventricular lesion with mild edema

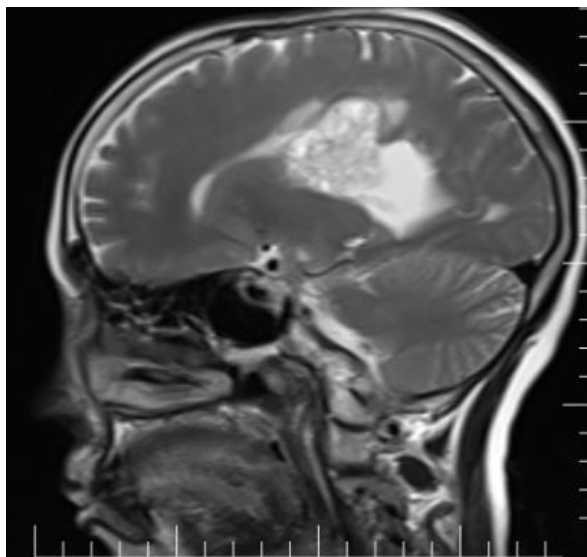


Fig.2. Brain MRI T2 Sagittal view showing hyperintense intraventricular mass lesion with mild

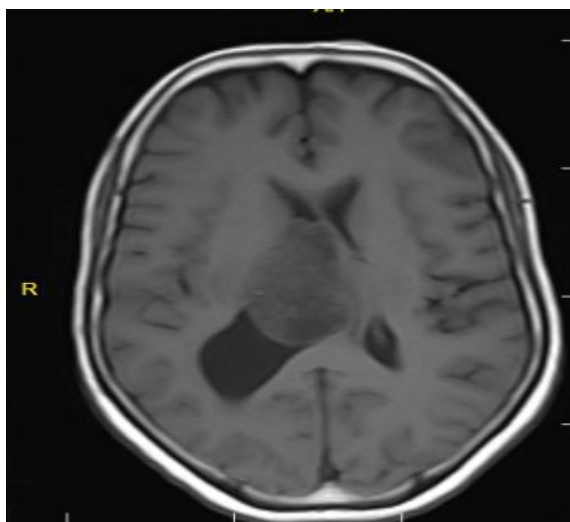


Fig.3. Brain MRI T1 Axial view showing isointense intraventricular mass lesion with mild lateral ventricular compression.

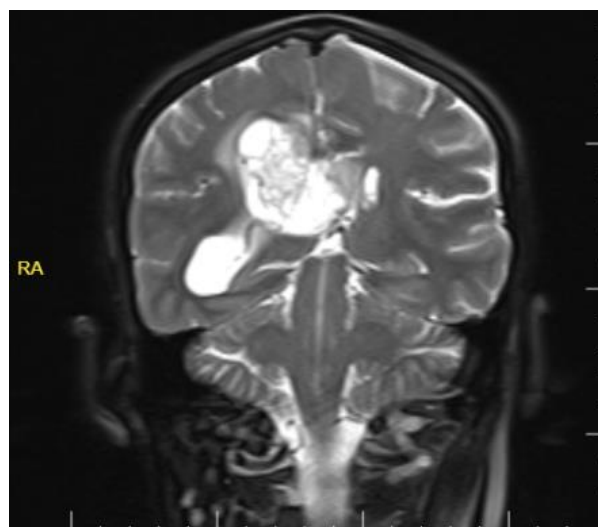


Fig.4. Brain MRI T2 Coronal View showing hyperintense intraventricular mass lesion with mild edema around it and lateral ventricular compression.

Discussion

Central neurocytoma is a rare benign central nervous system tumor that usually develops in the lateral ventricles. Many advances have been made in diagnosis and therapy since it was first reported in the early 1980s(4). Despite the advances, identifying the causes of these rare tumors and developing effective new treatment techniques remains challenging. Central neurocytoma accounts for 0.1–0.5% of all primary brain tumors. Because CN is usually intraventricular, it manifests clinically as hydrocephalus (5). Although CN is more common in teenagers and young adults, it has also been documented in patients who are elderly or very young (2). Hydrocephalus is the common symptom of most neurocytomas, which is caused by the obstruction of the foramen of Monroe by the tumor. Increased intracranial pressure causes symptoms such as headaches, visual impairment, nausea, and vomiting. Other signs and symptoms include weakness, dizziness, paresthesia, tinnitus, seizures, memory loss, and loss of consciousness. Papilledema and ataxia are two common symptoms (5, 6). Our patient had a moderately severe headache that had worsened over the last eight months. The headache was not associated with nausea, vomiting, motor/sensory deficits, or paresthesia during the test. The examination revealed no diplopia, ophthalmoparesis, or cranial nerve impairments, as well as no concomitant papilledema on the fundus examination.

Diagnosis is generally put by the combination of MRI with immunohistochemical confirmation of specific molecular markers. Central neurocytomas comprise lobulated masses with well-defined borders and cyst-like areas (7). In magnetic resonance imaging (MRI), central neurocytomas are isointense to gray matter on T1-weighted sequences and hyperintense on T2-weighted images. These lesions may appear "bubbly" due to numerous cysts (8, 9). In our case, a brain MRI revealed a 45x41 mm heterogeneous intraventricular mass lesion with slight edema around it, which is typical of CN. Tumors in the lateral ventricle in young adults include subependymal hamartomas, which may look similar. They are typically found in the fourth ventricle and are usually more common in older individuals. They present with obstructive hydrocephalus, which is lacking in this case. Central neurocytoma in the lateral ventricle is usually adjacent to the septum pellucidum as one of its distinctive features.

Central neurocytoma shares many of the same histopathologic features as oligodendrogliomas and ependymomas. As a result, they have been misdiagnosed in the past. Immunohistochemistry and electron microscopy are used to validate the neuropathic diagnosis of CN (7). Unfortunately, due to a lack of resources, histopathology and immunohistochemistry could not be performed. Therefore, the diagnosis was based on the clinical picture and radiological data.

The goal of treatment is to achieve a gross total resection (GTR), which has an excellent prognosis and effective tumor control. The primary goal of the surgery is to achieve maximum resection with minimal neurologic compromise, restore the CSF pathways, and provide tissue for definitive histopathological diagnosis. Because most CNs are intraventricular and do not infiltrate the surrounding parenchyma, microsurgical techniques can be performed during gross total resection (1, 9). The GTR can be successfully performed in about half of the patients. Tumor size, location, lesion extent, attachment to surrounding structures, vascularity, and surgeon experience play essential roles in resectability. When GTR is impossible, adjuvant radiosurgery and radiotherapy may be considered to improve tumor control (10, 11). We referred our patient to the neurosurgery department for surgery. Surgical removal was recommended, but unfortunately, the patient and her family did not accept this treatment.

Conclusion

Central neurocytoma is a rare benign brain tumor presenting with signs of increased intracranial pressure. Brain MRI should be done in young patients with a headache that does not have the characteristics of primary headaches.

Consent for publication: Written informed consent was obtained from the patient to publish this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials: The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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Conflict of interest: The authors declare no conflicts of interest.

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