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Evaluation of a Mouthguard Customized Using the Occlusal Position during Maximal Grip Strength to Improve Sports Performance. A Case Report

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Abstract

Two customized mouthguards were developed for a 35-year-old male kickboxer. These were identical in thickness (the vertical dimension between the upper and lower jaws), the material, and similar in form (visible outline); however, one mouthguard was designed such that the horizontal jaw position was determined by the maximal grip strength obtained by the subject during the Bi-Digital O-Ring Test. Both mouthguards were satisfactory in terms of how they felt during wearing and breathing; however, the subject achieved higher kicking force, punching force, and back muscle strength while using the mouthguard with an optimized horizontal jaw position. These findings suggest that to enhance sports performance, it may be important to determine the optimal biting position. The grip strength obtained during the Bi-Digital O-Ring Test is a useful parameter for this assessment.

Keywords

Mouthguard, Sports Performance, Bi-Digital O-Ring Test

1. Introduction

Mouthguards are used for the prevention of traumatic dental injury and are important components of athletic equipment for participants of contact sports such as boxing, kickboxing, football, baseball, soccer, hockey, skateboarding, and gymnastics. In addition to the preventive role of mouthguards, there is some evidence that their use may influence athletic performance [1] [2] [3]. The purpose of this case report is to compare the effect of the occlusal position on sports

performance.

2. Case Presentation

The subject was a 35-year-old male kickboxer. He had passed for 9 years after he debuted as a professional kickboxer at 26 years old but results weren't good recently. A peak of physical ability had also passed like his age, so he would have liked to play by a good mouthguard which makes a good biting situation to promote sports performance. A customized mouthguard had previously been developed for the subject. However, improvement of the sports performance like the rise of the muscle strength wasn't shared from this old mouthpiece. Therefore, a new mouthguard was developed that was comparable to the old one in some dimensions. Both mouthguards had an occlusal vertical dimension of approximately 3 mm; however, the new mouthguard was designed with a horizon-tal biting position that was associated with the maximal grip strength achieved during a Bi-Digital O-Ring Test (**Figure 1**) [4] [5] [6].

To determine the horizontal jaw position, cotton blocks were placed on both molars such that the occlusal vertical dimension was raised by 3 mm at the anterior teeth; the subject was instructed to bite down, then move the lower jaw slightly while holding the cotton blocks between the upper and lower molars. Assessor administered the Bi-Digital O-Ring Test to identify the jaw position with the strongest grip. In this position, silicone rubber was poured into the space between the upper and lower jaws in order to record the occlusion. Plaster models of the upper and lower jaw were mounted using the silicone rubber to develop a customized mouthguard.

The new and old mouthguards (**Figure 2**, **Figure 3**) were used during a series of assessments that measured kicking force, punching force, and back muscle strength. As a result, kicking force, punching force, and back muscle strength were higher when using the new mouthguard (327 kg, 204 kg, and 92 kg, respectively) than those when using the old mouth guard (304 kg, 193 kg, and 82 kg, respectively); these differences reflect improvements of 7.6%, 6.3%, and 12.2%, respectively when using the new mouthguard.



Figure 1. The Bi-Digital O-Ring Test was used to assess grip strength over a range of jaw biting positions.



Figure 2. New mouthguad.



Figure 3. Old mouthguard. (Both outline form is similar. Vertical dimension between upper and lower jaw is the same, but horizontal biting position is different during placing them).

These assessments were video-recorded and can be observed on YouTube "Mouthguard for promoting sports performance"

<u>https://www.youtube.com/watch?v=EfJkfHJmShw</u>. In this video, the old and new mouthguards are referred to as the "normal" and "special" mouthguards respectively.

3. Discussion

Mouthguards are considered effective devices for buffering impacts that may cause dental and maxillofacial injuries during sports; however, their use alters the occlusal and mandibular positions. These changes have a substantial effect on full-body functioning [7]-[12] and may impact sports performance [13] [14] [15]. In this report, two customized mouthguards were compared. The old mouthguard raised the occlusal vertical dimension by approximately 3 mm at the anterior teeth; the new one provided the same occlusal vertical dimension but was designed with a horizontal occlusal position that was associated with the maximal grip strength achieved during the Bi-Digital O-Ring Test [4] [5] [6] [11] [12]. When using the new mouthguard, higher kicking force, punching force, and back muscle strength were achieved than those achieved when using



Figure 4. The subject won a championship event while using the new mouthguard in spite of older age as a sports player.

the old mouthguard. Following this study, the subject won a championship event while using the new mouth guard in spite of older age as this sports player (**Figure 4**). It is not clarified underlining mechanism why the sports performance has so improved by changing the horizontal occlusal position. However, anatomically, the trigeminal nerve existing around the oral cavity is the largest among the 12 pairs of cranial nerves. This fact suggests that quite much information is transmitted to a brain from a mouth. This is also clear from the experience that an author improved serious Alzheimer's disease by locating dentures [12]. In our study, it was useful to determine the optimal biting jaw position associated with better sports performance, which was represented by grip strength determined using the Bi-Digital O-Ring Test.

4. Conclusion

Mouthguards are essential equipment for athletes who take part in contact sports. In addition to preventing injury, mouthguards designed using the optimal occlusal position may improve sports performance. A useful measure to determine this is the maximal grip strength achieved during a Bi-Digital O-Ring Test.

Acknowledgments

The subject agreed for his case to be reported.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Organoaxial Gastric Volvulus—Chronic Hematoma and a Gastric Twist

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Abstract

A 70-year-old male presented with gastric volvulus secondary to a hematoma that caused an organoaxial rotation. Contrast-enhanced CT was contributory to the diagnosis. The patient underwent laparotomy with gastrojejunostomy and jejunojejunostomy. We present our findings and review the literature of this uncommon pathology. A written informed consent was obtained from the patient for publication of this case.

Keywords

Organoaxial, Gastric, Volvulus, Chronic, Hematoma

1. Introduction

Gastric volvulus is a rare entity which can be difficult to diagnose. Gastric volvulus is defined as a twist or an abnormal rotation of the stomach of over 180 degrees. The presentation can be acute where the volvulus results in a closed loop foregut obstruction [1], compromises the blood supply to the affected segment and is a surgical emergency. In some patients, the symptoms are non-specific and will present with an intermittent dull aching abdominal pain, nausea and loss of weight because of poor oral intake. Gastric volvulus is classified into primary and secondary types. Primary gastric volvulus occurs as a result of laxity in the ligaments that anchor the stomach to the surrounding organs and secondary gastric volvulus is due to a pathology elsewhere. More specifically, the volvulus is either organoaxial or mesenteroaxial; the former is more common and leads to disastrous complications if left undiagnosed. X-ray can raise a high index of suspicion, but a computed tomographic scan of the abdomen will confirm the diagnosis. The aim of the surgery is to decompress the stomach and prevent re-rotation of the stomach. Medical and endoscopic man-

agement is primarily advised to older patients who are not fit for surgery. Surgical or laparoscopic intervention is the treatment of choice in patients presenting with signs of acute gastrointestinal bleeding.

2. Case Presentation

A 70-year-old patient came to the emergency room with complaints of upper abdominal dull aching pain, fullness and dyspepsia for 3 days duration. He gave history of loss of weight for the last 3 months. He gave an alleged past history of blunt abdominal trauma for which he was conservatively treated in a local hospital. On clinical examination, the epigastric region was grossly distended, yet a nasogastric tube could not be inserted. UGI scopy showed a distorted stomach with stasis of fluid. Contrast-enhanced CT abdomen (**Figure 1(a)** and **Figure 1(b)**) showed a grossly distended stomach that was abnormally oriented; the fundus was situated anteroinferiorly and the pylorus was situated superior and anterior to the gastro-esophageal junction, consistent with gastric volvulus.

At laparotomy, pancreas was visualised through a rent in the greater omentum (Figure 2). The omentum was adherent to an organized hematoma at the



Figure 1. Shows the dilated and abnormally oriented stomach.



Figure 2. Shows the rent in the omentum and the dilated stomach.

OG junction, and this had caused an organoaxial volvulus. The volvulus was derotated, malignancy excluded and an anterior gastrojejunostomy with jejuno-jejunostomy was performed. The post operative period was uneventful and at 2 months follow up, the patient had gained 1 kg weight and the endoscopy was normal (stoma was healthy, the afferent and efferent loops functioning well)

3. Discussion

Gastric volvulus occurs in 10% - 20% of children less than 1 year of age and is uncommon in adults [2]. The classical triad was described by Bouchardt in 1904 [3]. Primary gastric volvulus occurs due to the laxity, disruption or elongation in the ligamentous structures attached to the stomach; the gastrohepatic, gastrocolic, gastrolienal and gastrophrenic ligaments [4]. Secondary gastric volvulus is due to a defect in the gastric anatomy or due to defects in the adjacent structures, neuromuscular diseases (motor neuron disease [5], poliomyelitis [6]), intra-abdominal tumours and factors that cause diaphragmatic elevation (such as phrenic nerve palsy [7], left lung resection [8]). Gastric volvulus can be organoaxial (59%) [9] and mesenteroaxial rotation (more common in children). The risk of strangulation in an organoaxial rotation is between 5% - 28% and is low in mesteroaxial rotation [10].

70% of the patients with acute organoaxial volvulus present by Bouchardt's triad; epigastric discomfort, retching and the inability to pass a nasogastric tube [11]. The close proximity of the cardia and the fundus of the stomach to the lower esophageal sphincter and the 180 degree turn along the two fixed points of the stomach (cardia and pylorus) are the reasons why difficulty is encountered when inserting the nasogastric tube. Chronic gastric volvulus presents with vague, dull aching, intermittent abdominal pain, early satiety, dyspepsia, loss of weight and loss of appetite [4]. Hiccups is a subtle sign of gastric volvulus [12]. Hematemesis occurs after mucosal ischaemia and sloughing.

A plain erect abdominal x-ray film demonstrates a spherical stomach with double air fluid levels. Albas *et al.* described 4 radiological findings predictive for a gastric volvulus at contrast imaging; namely, gastric air fluid level above the diaphragm, a paucity of distal bowel gas, a reversal of the relative position of the greater curvature of the stomach and a downward pointing pylorus [13].

After resuscitation and medical optimization, the aim of the surgery is to decompress and de-rotate the volvulus and fix the stomach to prevent recurrence. The gastropexy can be approached laparoscopically also. Morelli *et al.* anchored the stomach to the anterior abdominal wall by placing 4 sutures on the greater and lesser curvature of the stomach near the fundus and the body [14]. Palanivelu *et al.* performed laparoscopic suture gastropexy in 14 patients (10 chronic volvulus and 4 acute). Majority of patients presented with a secondary gastric volvulus. All 14 patients did not develop complication post operatively [15]. In older patients who are unfit for surgery, endoscopic gastrostomy (PEG) showed good results [16]. Combined laparoscopic and endoscopic management of the volvulus is reported. In cases of secondary gastric volvulus, the paraesophageal hernia must be repaired. Robotic repairs of parahiatal hernia with a mesh offer a tension free primary closure of the defect [17].

4. Conclusion

Gastric volvulus is rare, has a non-characteristic presentation and results in strangulation if undetected. A high index of suspicion is needed for a clinical diagnosis. The imaging findings are characteristic and confirm the diagnosis. Laparoscopic/open derotation and pexy offer good results for this uncommon condition.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Complex Inpatient Pain Management in a Critically Ill Lung Transplant Recipient: A Case Report

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Abstract

Thoracic surgery is known to cause severe pain that may not subside during the course of hospitalization. Early pain control is important in these patients because it improves ventilation and promotes mobility. Lung transplant recipients can experience post-operative complications that lead to extended hospital stays. This increases the time a patient is sedentary, which further deconditions patients; therefore, rehabilitation should be initiated early post-operatively. We present a unique case of a critically ill double lung transplant recipient whose rehabilitation post-operatively was hindered by severe vasopressor-induced ischemic pain. Due to debilitating pain, he was unable to regain mobility. His pain management course was challenging due to sensitivity to opioids, renal failure, and anticoagulation.

Keywords

Pain Management, Regional Anesthesia, Lung Transplant, Ischemic Pain

1. Introduction

Bilateral lung transplant recipients receive bilateral thoracosternotomy (clamshell) incisions that are associated with severe pain. Some patients report continuous pain months to years post-operatively that limits their mobility [1] [2]. Early pain control is important in these patients because it can improve ventilation and promotes mobility. Post-transplant, patients can have complications such as massive blood loss, infection, ventilator dependence, and organ rejection that lead to extended hospital stays. Prolonged hospitalization increases the time a patient is sedentary and further deconditions patients; therefore, rehabilitation should be initiated early post-operatively. Early physical therapy and mobility post-operatively can lead to improved quality of life and physical function [3] [4].

Pain can hinder a patient's mobility and recovery. In critically ill patients on vasopressors, ischemic skin necrosis can be an unfortunate complication. The poor tissue perfusion and bullous skin changes can cause unbearable, constant pain that is usually burning in nature. It can lead to devastating functional consequences, especially in the limbs. When surgical interventions such as debridement, amputation, and/or revascularization are not indicated, the main goal is treating the symptoms through pain management. Common ways to treat ischemic pain include targeting different pain receptors pharmacologically and with nerve blocks. We present a unique case of complex pain management in a critically ill lung transplant recipient who was sensitive to opioids, had renal failure, and was on anticoagulation. His significant pain limited his recovery post-operatively, and our inpatient pain management service played an integral role in his recovery.

2. Case Overview

The inpatient pain management service was consulted for a 64-year-old male with significant bilateral lower extremity ischemic pain. Our patient had a history of pulmonary fibrosis and had received a bilateral lung transplant a few weeks prior. His post-operative hospital course was complicated by mechanical ventilation and extracorporeal membrane oxygenation (ECMO) for worsening hypoxia, continuous renal replacement therapy (CRRT) and eventually hemodialysis (HD) for acute renal failure, and multiple vasopressors for hemodynamic instability. Unfortunately, he eventually developed ischemia of his bilateral toes and part of his feet (Figure 1 & Figure 2). No surgical intervention for debridement or amputation was indicated.

Initially, the intensive care unit (ICU) team attempted managing his pain. However, there were significant limitations due to his critical status. He was unable to tolerate opioid medications because of significant ileus leading to sepsis, encephalopathy, and extreme somnolence. Our patient also had hemodynamic instability that precluded the use of medications such as dexmedetomidine and intravenous lidocaine. Podiatry had recommended topical therapies; however, due to the high risk of infection, the therapies were contraindicated. Prior to consultation with the inpatient pain management service, the patient's pain was being managed with a ketamine infusion and acetaminophen (Please refer to **Figure 3** for ICU course by post-operative day). Given his waxing and waning mental status on this regimen, the patient was also being monitored in the ICU while on ketamine.

Given the significant limitations of the patient's recovery secondary to pain control, the ICU team consulted the inpatient pain management service to assist with optimizing care. Our in house pain management team assessed the patient and worked with the ICU to implement a thoughtful multimodal pain regimen



Figure 1. Severe cyanosis of the right forefoot spanning the digits to the metatarsal heads on the plantar (a) and dorsal (b) aspects of the foot. Fluid-filled bullae on the dorsum of the forefoot.



Figure 2. Severe cyanosis of the left forefoot and midfoot extending over the left ankle plantar (a) and dorsal (b) aspects of the foot. Fluid-filled bullae on distal, lateral foot.



ICU Course By Post-Operative Day

Figure 3. ICU Course by post-operative day. Events in the ICU are shown in red with arrows. Continuous pharmacological treatment is depicted with boxes spanning the post-operative days our patient received this pharmacological treatment. The brackets indicate the dosing administered. Regional anesthesia is shown in green with an asterisk (*), which indicates the post-operative day. Our patient's reported pain score is shown in purple on a scale of 0 through 10. Initially, he was sedated and/or too somnolent to participate in reporting his pain level.

as described below.

For pain control, he was initially started on infusions of fentanyl at 25 mcg/hr, ketamine at 0.67 mg/kg/min, and naloxone at 0.25 mcg/kg/hr (for opioid-induced ileus per hospital protocol). Higher doses of fentanyl made him very somnolent and caused altered mental status. These pharmacologic treatments provided minimal analgesia for our patient. At the same time, he was on a heparin infusion due to multiple deep vein thrombosis (DVTs), which limited the procedural blocks we could offer. We considered neuraxial blockade, but given his need for a heparin infusion, we opted to not pursue this route. Bilateral ankle blocks with bupivacaine 0.25% were provided; however, they gave him only 5 hours of pain relief. Although short lived, this did provide the patient with a full night's sleep, and afterwards, he had a significant improvement in his mental status. Two days later, popliteal blocks were administered which temporarily reduced his pain (Please see Figure 3 for patient's reported pain score by post-operative day). The decision was made to temporarily hold his heparin infusion for 6 hours for bilateral popliteal nerve block catheter. The catheter could only be threaded on the left side, so he received 0.25% bupivacaine, which was started at 4 cc/hour and weaned down over the course of five days. He received a single shot popliteal block on his right leg. These nerve blocks along with infusions of fentanyl, which was reduced to 15 mcg/hr, ketamine at 0.67 mg/kg/min, naloxone at 0.25 mcg/kg/hr, and gabapentin 200 mg solution significantly reduced our patient's pain level. Due to his renal dysfunction, gabapentin dosing and administration was carefully coordinated with the nephrologist. Through multi-modal pain management, he became able to comfortably tolerate weight-bearing activities and actively participate with physical therapy. He was also safely transferred out of the ICU for further recovery.

3. Discussion

The therapeutic goal of treating ischemic pain is to improve quality of life and functional status. In our patient's case, vasopressor-induced ischemia of the bilateral toes and feet caused relentless pain that he reported as significantly worse than the pain from the thoracic clamshell incisions across his chest for his bilateral lung transplant. In fact, once his organs began to recover, it was his challenging pain control that greatly hindered the recovery of an otherwise successful lung transplant surgery. It prevented him from working with physical therapy, leading to further deconditioning and poor quality of life.

For patients with inoperable ischemia, the initial step in treating ischemic pain is through pharmacologic means. Opioids are used to treat severe ischemic pain. Synthetic, short-acting opioids such as fentanyl and alfentanil can be safely administered to patients with kidney failure [5]. In order to prevent opioid side effects including constipation, delayed gastric emptying, and ileus, low doses of naloxone can be used simultaneously with the administration of opioids without affecting analgesia [6] [7].

Ischemic pain also has a component of neuropathic pain that can be treated with medications such as ketamine and gabapentin. Even a 4-hour infusion of ketamine can give patients significant ischemic pain relief for a few days following the infusion [8]. In another study, patients who received a median daily dose of 1271 mg of gabapentin in addition to high dose opioids reported significant reductions in their pain scores [9]. Unfortunately, patients with renal failure are unable to take gabapentin as it is eliminated by renal excretion. The refractory nature of the ischemic pain coupled with our patient's acute kidney failure made it very difficult to treat the pain pharmacologically. We started him on a fentanyl infusion and soon after a ketamine infusion in hopes that the μ -opioid agonist and NMDA antagonist properties would synergistically reduce his pain level. Eventually, we were able to start him on a low dose of gabapentin after his kidney function improved. Yet, he continued to have intolerable pain.

Interventional treatments should be considered when patients have ischemic pain that is refractory to pharmacologic management. Surgical or chemical sympathectomy can help reduce pain via vasodilation and subsequent improvement of blood flow to areas of ischemia to promote healing. Sympathectomy can also act on nociceptive fibers to block sympathetic-nociceptive coupling to reduce pain [10]. For upper extremities, a stellate ganglion block can be considered for sympathectomy. This block can be effectively used to treat pain caused by vascular insufficiency for patients with atherosclerosis, Reynaud's disease, and thromboembolism [11] [12]. For lower extremities, epidural or spinal anesthesia can cause a chemical sympathectomy. A recent study has found chemical sympathectomy to be as effective as surgical lumbar sympathectomy in controlling ischemic pain [13]. Unfortunately, we were unable to consider chemical sympathectomy such as an epidural for this patient because he was receiving therapeutic levels of heparin for known DVTs. The risk of hematoma in the spinal cord outweighed the benefits of potential ischemic pain relief; therefore, we considered other blocks instead.

Continuous peripheral nerve blocks can also be efficacious in treating ischemic pain [14]. A lumbar plexus block can be used as an alternative to chemical sympathectomy for the lower extremities. When compared to epidurals, a lumbar plexus block is a unilateral block that provides similar analgesia with fewer adverse effects such as hypotension, urinary retention, and nausea [15]. Although it is safer to perform a lumbar plexus block than an epidural or spinal block for patients that are taking anticoagulants, there is still a significant risk of bleeding that can go unnoticed given that this block is deep. The German and Austrian Societies of Anesthesiology recommend the same guidelines be used for deep plexus blocks and neuraxial blocks when patients are on anticoagulants [16]. Although we considered bilateral lumbar plexus blocks for our patient's ischemic pain, we ultimately decided that superficial blocks of the ankle and popliteal region would be safer initial therapy before considering deeper plexus blocks due to the anticoagulation he was receiving.

4. Conclusion

Thoughtful multi-modal pain management played a pivotal role in our patient's

recovery after receiving a lung transplant. Despite the limitations due to opioid sensitivity, kidney failure, and anticoagulation, we were able to effectively control his pain through our inpatient pain management service. Once his pain was well controlled, he was downgraded from the ICU, able to ambulate with assistance, transitioned to oral pain medications, and reported improved quality of life. A few weeks later, he was discharged to a rehabilitation center.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Gestational Trophoblastic Diseases: A Review of the Clinical Presentation and Management at the Alex Ekwueme Federal University Teaching Hospital Abakaliki

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Abstract

Background: Gestational trophoblastic diseases (GTD) are potentially curable with retention of reproductive function once the correct diagnosis is made and treatment is commenced early with adequate follow up. Objective: The objective of this study was to determine the incidence, clinical presentation, management and treatment outcomes of gestational trophoblastic diseases in a tertiary hospital in Abakaliki, South-east Nigeria. Materials and Methods: This was a retrospective descriptive study of gestational trophoblastic diseases managed at Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AEFUTHA) over a 6-year period. The statistical analysis was done using SPSS version 22. Results: The incidence of GTD was 4.6 per 1000 deliveries. Women who were less than 20 years and more than 40 years of age accounted for 5.9% and 23.5% of cases of GTD respectively. Women who were para 5 and above accounted for 76.5% of those who presented with GTD. All the patients presented with vaginal bleeding. Suction evacuation (76.5%) was the commonest form of treatment offered to women with GTD. The commonest complication was anaemia (94.1%). Maternal death due to GTD was 8.8%. Most (58.8%) of the patients did not turn up for follow-up. Conclusion: Gestational trophoblastic diseases has remained an important cause of maternal morbidity and mortality in our hospital due to poor compliance with follow-up. Call and recall system should be introduced in the management of patients with GTD to improve compliance to management standard.

Keywords

Gestational, Maternal, Mortality, Chemotherapy, Follow-Up

1. Introduction

The history of the management of gestational trophoblastic diseases can be considered as one of the success stories of modern medicine, as the majority, if not all, are potentially curable with the retention of reproductive function once the correct diagnosis is made and treatment is commenced early [1]. Gestational trophoblastic disease defines a heterogeneous group of interrelated lesions arising from the trophoblastic epithelium. They include hydatidiform mole, invasive mole, placental site trophoblastic tumour and choriocarcinoma [1]-[6].

The incidence of GTD varies greatly throughout the world [1] [2] [3] [4]. The exact incidence in Nigeria is not known [4]. Gestational trophobastic tumours account for 5.3% of gynaecological tumours in a study done in Enugu [4]. In Kano, the incidence of GTD was 4.5 per 1000 deliveries [2].

The aetiology of GTD is not as well understood [4]. However, it has been associated with ethnicity, extremes of reproductive age (<20 years and >40 years), prior molar pregnancy, lower socioeconomic class and dietary deficiency of protein, folic acid and carotene [1] [2] [3].

Gestational trophoblastic diseases are usually suspected in patients with amenorrhoea presenting with vaginal bleeding, the passage of grape-like vesicles, hyperemesis gravidarium, fundal height greater than estimated gestational age and positive serial hCG estimation [1]-[8].

Complications associated with GTD include haemorrhage, anaemia, preeclampsia prior to 20 weeks gestation, thyrotoxicosis, shock and death [3] [4] [5].

Ultrasound is a non-invasive, safe, economical and relatively simple technique used in the diagnosis of GTD [2] [4]. The definitive diagnosis is made by histological examination of the products of conception [4].

The treatment of GTD depends on the clinico-histopathological type and may include suction evacuation, chemotherapy, hysterectomy and radiotherapy [4].

Follow up is essential in all cases of GTD so that persistent active trophoblastic tissue will be detected [1]-[10]. Follow-up is by history, physical examination, serial quantitative B-hCG estimation and chest X-ray when indicated. Pregnancy is discouraged during follow-up to avoid interfering in patient's B-hCG monitoring, while an effective contraceptive method is commenced and maintained throughout the period of surveillance [3] [5] [6] [7].

The risk of recurrence is 1% [3]. A woman who has had 2 molar gestation has a recurrence rate of 15% - 28% [3]. As a result, the patient should be advised to report to the hospital once she misses her period after follow-up [3].

Gestational trophoblastic diseases are of great interest because of their excellent prognosis if diagnosed and treated early and the potential for child bearing can be maintained [7].

Considering the poor outcome in our patients of this otherwise generally good prognostic condition, the study is important. The findings of this study may help the policy makers and other stakeholders plan on how to implement appropriate strategies to reduce the maternal morbidity and mortality arising from it.

The objective of this study was to determine the incidence, clinical presentation, management and treatment outcomes of gestational trophoblastic diseases.

2. Materials and Method

2.1. Study Area

Abakaliki is the capital of Ebonyi state located in the south-east geographical zone of Nigeria. It has a total population of 267,386 [11]. Alex Ekwueme Federal University Teaching Hospital is a tertiary institution located in Abakaliki. It receives referral from all parts of the state and neighbouring states of Benue, Enugu, Cross River and Abia as well as any part of the country. The Obstetrics and Gynaecology department has 5 teams. Each team is headed by the most senior consultant with the responsibility of training of resident doctors and house officers. The gynaecologic patients are seen at the Gynaecologic clinic and ward, Accident and Emergency department, Intensive care unit and theatre.

2.2. Study Design

This was a retrospective descriptive study of women who were managed for gestational trophoblastic diseases in the Federal Teaching Hospital, Abakaliki. The period under review was 1st January 2012 to 31st December 2017. The hospital numbers of women that had GTD during the study period were retrieved from the admission register in the gynaecological ward and intensive care unit. Then the case notes were retrieved from the Medical Records Department of the hospital using the hospital numbers. A proforma containing information on sociodemographic characteristics, risk factors such as age, parity and history of previous GTD, clinical presentations, complications, mode of treatment and follow up of patients was used to extract information from the case notes. The statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 22 software.

2.3. Ethical Consideration

The approval for the study was obtained from the Research and Ethical Committee of the Alex Ekwueme Federal University Teaching Hospital, Abakaliki.

3. Results

There were 68 cases of gestational trophoblastic. During the study period, there were 14,636 deliveries and 3100 gynaecological admissions. The incidence of GTD was 4.6 cases per 1000 deliveries and it accounted for 2.2% of gynaecological admission.

The mean age at diagnosis was 32.1 ± 4.6 years. Women who were less than 20 years and more than 40 years of age accounted for 5.9% and 23.5% of cases of GTD respectively (**Table 1**). Majority of women (61.8%) were farmers and 44.1% had no formal education. Women who were para 5 and above accounted for 76.5% of those who presented with GTD (**Table 1**). The commonest clinical presentation was vaginal bleeding (100%) while 97.1% of women had amenorrhoea. Only 2.9% of patients had previous history of GTD (**Table 2**). The commonest complication was anaemia (94.1%). Acute haemorrhage accounted for 70.6% of complications of GTD in the patients. Three (8.8%) of the patients that were managed for metastatic choriocarcinoma suffered maternal death during follow up (**Table 2**).

Suction evacuation (76.5%) was the commonest form of treatment offered to women with hydatidiform mole in FETHA (**Table 3**). Four (5.9%) patients with hydatidiform mole were offered hysterectomy for uncontrollable haemorrhage following suction evacuation. Sixteen (23.5%) patients had chemotherapy in cases of choriocarcinoma while twelve women with hydatidiform mole had chemotherapy using methotrexate in cases of persistent rise or plateau of B-hCG. For all cases of choriocarcinoma, WHO scoring was done. Three cases of low risk patient (score \leq 6) received single agent chemotherapy with methotrexate while five cases of high risk patient received chemotherapy with etoposide, methotrexate, actinomycin D, cyclophosphamide and vincristine [EMACO] regimen.

Characteristics	Frequency	Percentage
Age (years)		
≤20	4	5.9
21 - 39	48	70.6
≥40	16	23.5
Occupation		
Housewife	4	5.8
Farmer	42	61.7
Self employed	18	5.8
Civil servant	4	26.4
Educational status		
No formal education	30	44.1
Primary	24	35.2
Secondary	12	17.6
Tertiary	2	2.9
Parity		
0	2	2.9
1 - 4	14	20.5
≥5	52	76.4

Table 1. Sociodemographic characteristics of women with GTD.

Features	Frequency	Percentage
Clinical presentation		
Amenorrhoea		07.1
Vaginal bleeding	66	97.1
Previous history of GTD	68	100.0
Abdominal swelling	2	2.9
	46	67.6
Excessive vomiting	24	35.2
Passage of vesicles	32	47.1
Fundal height > gestational age	64	94.1
Cough	6	8.8
Complications		
Acute haemorrhage	48	70.5
Anaemia	64	94.1
Preeclampsia/Hypertension	8	11.7
	2	2.9
Thyrotoxicosis	16	23.5
Shock	6	8.8
Death	0	0.0

Table 2. Clinical presentation and complications of GTD.

Table 3. Mode of treatment offered to women with GTD.

Treatment method	Frequency	Percentage
Suction evacuation only	52	76.4
Suction evacuation with chemotherapy	12	17.6
Suction evacuation with hysterectomy	4	5.8
Hysterectomy only	0	0.0
Hysterectomy with chemotherapy	0	0.0
Chemotherapy only	16	23.5

All the patients were offered contraception during treatment for GTD. Barrier methods using male condom was the commonest contraceptive method of choice for women with GTD. Twenty-two (36.7%) patients used subdermal Levonorgestrel for contraception (Table 4).

Majority of the women (58.8%) did not turn up for follow-up. Twenty patients had follow-up for 1 year (**Table 5**). During follow-up, patients were evaluated with the serum B-hCG levels, ultrasound, chest X-ray (if indicated) and menstrual cycle of patients were enquired.

There were sixteen (23.5%) cases of choriocarcinoma and fifty-two (76.5%) cases of hydatidiform mole. There was no case of invasive mole or placental site trophoblastic tumour (**Table 6**).

Frequency	Percentage
34	50.0
22	32.3
12	17.6
	Frequency 34 22 12

Table 4. Contraceptive methods offered to women with GTD.

Table 5. Duration of follow-up.

Duration	Frequency	Percentage
0 - 6 months	16	23.5
6 months - 1 year	12	17.6
>1 year	0	0.0
Did not turn up for follow-up	40	58.8

Table 6. Histological type of GTD.

Histology type	Frequency	Percentage
Hydatidiform mole		
Complete	36	53.0
Partial	16	23.5
Choriocarcinoma	16	23.5
Invasive mole	0	0
Placental site trophoblastic tumour	0	0

4. Discussion

The incidence of GTD in this study was 4.6 cases per 1000 deliveries. This finding shows that the condition is common in our environment. The incidence of GTD in this study is comparable to the incidence of 4.7 per 1000 deliveries reported in Nnewi [4] and 4.5 per 1000 deliveries in Kano [2]. However, it is much higher than incidences of 1 per 1000, 1.3 per 1000, and 2 per 1000 pregnancies reported in the United States, the United Kingdom and Japan respectively [2]. This high incidence of GTD in our centre may be due to the status of the teaching hospital as a referral centre from various clinics both private and public.

The aetiology of GTD is unknown [2]-[6]. However, there are several risk factors which include extremes of maternal age < 20 years and > 40 years, prior history of molar gestation, low socioeconomic status and high parity [3] [4]. Maternal age has been found to influence the risk of GTD; the incidence being more in women under the age of 20 years and rising sharply after the age of 40 years. The findings from this study do not support this; it is however in conformity with studies done in Jos and Nnewi [7] [8]. Women less than 20 years and those more than 40 years of age accounted for 29.4%. A large proportion of the

patients (76.5%) were of high parity (\geq 5) and this conforms with a report from some authors where most patients were of high parity [7]. A history of Previous molar gestation has consistently been shown to influence the risk of GTD [2]. However, in this study, only 3% of patients had a prior history of GTD. This is similar to a study in Jos in which 8% of patients had a previous history of GTD [8].

Vaginal bleeding and amenorrhoea are the most common clinical presentation of GTD in this study. It is, therefore, necessary for all patients with such complaints in early pregnancy to have ultrasound scan which is reliable in the diagnosis of the condition. Other common clinical features include abdominal swelling, the passage of vesicles and symphysiofundal height greater than gestational age. These findings are similar to the findings from similar studies [9].

Suction evacuation (76.5%) was the preferred method of treatment for women with hydatidiform mole in this study. Suction evacuation allows for rapid evacuation of the uterus, reduces the danger of uterine perforation and provides specimen for histology. Only 5.9% of patients had hysterectomy for uncontrollable haemorrhage following the suction evacuation. Chemotherapy was given to 23.5% of the patients. Chemotherapy was introduced in cases of persistent rise or plateau of B-hCG and in cases of choriocarcinoma. Studies have shown that the incidence of persistent GTD may be decreased with prophylactic chemotherapy. [9] It is controversial whether prophylactic chemotherapy following evacuation should be offered to patients considered high risk for persistent gestational trophoblastic disease or whom poor compliance to follow up is anticipated [10]. However, prophylactic chemotherapy can be a viable option in our setting because of poor compliance to follow-up of our patients.

Follow up of patients with GTD is very important and it allows early detection of persistence disease [12]. Unfortunately, most (58.8%) of the patients did not turn up for follow-up. The poor compliance to follow-up may be as a result of poverty, illiteracy, cultural attitudes and inadequate health education. Adequate counselling and introduction of call and recall system may help to improve compliance to treatment follow-up.

The mortality rate in this study is 8.8%. This is comparable to 13.3% and 6.8% reported in Nnewi and Kano respectively [2] [4]. This was considerably high when compared to reports from developed nations [12]. The early diagnosis, adequate treatment and adherence to follow-up in developed nations could explain the documented good prognosis for this condition.

5. Conclusion

Gestational trophoblastic diseases have remained an important cause of maternal morbidity and mortality in our hospital. There is a need for early diagnosis and adequate treatment of this condition. Adequate follow-up of the patients should be re-emphasized. Call and recall system should be introduced in the management of patients with GTD to improve compliance to management standard.

Limitation

The limitations of this study include the fact that there was poor compliance to follow-up such that the incidence of subsequent pregnancies after complete treatment of GTD was not studied.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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