Central Nervous System Involvements of the Lemierre Syndrome: case report and mini-review of the literature

Envolvimentos do Sistema Nervoso Central na Síndrome de Lemierre: relato de caso e mini-revisão da literatura

Feyzi Birol Sarica¹
Kemal Kapanoglu²
Iskender Samet Daltaban³
Ilknur Senel⁴
Ilyas Tadayyon Einaddin Karakoc²

ABSTRACT

Lemierre syndrome is a rare disease with fulminant course observed in healthy young adults. After an oropharyngeal infection, it is characterized by internal jugular vein thrombophlebitis, septicemia, and necrotic abscesses in distant organs. Mostly its causative microorganism is the Fusobacterium necrophorum. In these cases mortality rate used to be around 90%, but today this rate has decreased to 5% with early diagnosis and appropriate antibiotic treatment. Although the Lemierre syndrome, which was described in 1936, was widely observed in the pre-antibiotic period, the number of cases decreased dramatically after the widespread use of antibiotics in 1950s and 1960s. Facing this situation the Lemierre syndrome started being called the “forgotten disease” in the relevant years. In 1970s, it was observed its cases tended to increase according to the developments in radiological imaging techniques. However, the reviews in literature showed a remarkable increase in the incidence of Lemierre syndrome cases, especially in the last 15 years. In this article, a case of Lemierre Syndrome with sequelae of left abducens nerve palsy was presented with a literature review.

Keywords: Human necrobacillosis; Internal jugular vein thrombosis; Jugular septic thrombophlebitis; Postanginal sepsis; Suppurative jugular thrombophlebitis

RESUMO

A síndrome de Lemierre é uma doença rara com curso fulminante observada em adultos jovens saudáveis. Após uma infecção orofaríngea, caracteriza-se por tromboflebite da veia jugular interna, septicemia e abscessos necróticos observados em órgãos distantes. O microrganismo causador é principalmente Fusobacterium necrophorum. A taxa de mortalidade nesses casos costumava ser em torno de 90% e hoje reduziu para 5% com o diagnóstico precoce e o tratamento antibiótico adequado. Embora a síndrome de Lemierre, descrita em 1936, tenha sido amplamente observada no período pré-antibiótico, o número de casos diminuiu drasticamente após o uso generalizado de antibióticos nas décadas de 1950 e 1960. Esta situação a levou a ser chamada de “doença esquecida” nos anos relevantes. Na década de 1970, observou-se que os casos de síndrome de Lemierre tendiam a aumentar segundo o avanço das técnicas de imagem radiológica. No entanto, as revisões feitas na literatura mostram que houve um aumento notável na incidência de casos de síndrome de Lemierre, principalmente nos últimos 15 anos. Neste artigo, foi apresentado um caso de Síndrome de Lemierre com sequelas de paralisia do nervo abducente esquerdo com revisão da literatura.

Palavras-Chave: Necrobacilose humana; Trombose da veia jugular interna; Tromboflebite séptica jugular; Sepse pós-anginosa; Tromboflebite jugular supurativa

¹ MD, PhD, Associate Professor, Department of Neurosurgery, Giresun Education and Research Hospital, Medical School, University of Giresun, Giresun, Turkey.
² MD, Department of Neurosurgery, Giresun Education and Research Hospital, Giresun, Turkey.
³ MD, Department of Neurosurgery, Trabzon Kanuni Education and Research Hospital, Trabzon, Turkey.
⁴ MD, PhD, Assistant Professor, Department of Infectious Diseases and Clinical Microbiology, University of Giresun Medical School, Giresun, Turkey.

Received Apr 30, 2022
Accepted May 15, 2022
INTRODUCTION

Lemierre Syndrome (LS), also called as human necrobacillosis, jugular septic thrombophlebitis, suppurative jugular thrombophlebitis, and postanginal sepsis, is a rare disease observed in healthy young adults\(^1\)\(^-\)\(^6\). LS was quite common and quickly became fatal within 7 to 15 days before the development of antibiotic drugs\(^7\). In the majority of cases, the septic thrombophlebitis develops in the jugular vein following the acute pharyngitis or tonsillitis. In fewer cases, the odontogenic infections, sinusitis, otitis and mastoiditis can be considered as primary infection foci. The most common microorganism in the sepsis, originating from the oropharynx, is \textit{Fusobacterium necrophorum} (\textit{F. necrophorum}), which is found in the normal oral flora. \textit{F. necrophorum} is rod-shaped and is a gram-negative and obligate intracellular anaerobic bacterium\(^1,7\). Although more rarely, LS cases in which other causative microorganisms – such as \textit{F. nucleatum}, \textit{Staphylococcus aureus}, \textit{Streptococcus viridans}, \textit{Streptococcus pyogenes}, \textit{Porphyromonas asaccharolytica} and common anaerobic oral cavity bacilli – are responsible were also reported.

CASE PRESENTATION

A 46-year-old male patient was admitted to our Neurosurgery Department with a complaint of frontal headache. The patient’s frontal headache complaint had been intermittent for 1 week. During his neurological examination a “lateral gaze restriction” was found, on the left, as a sign of abducens nerve palsy. However, diplopia was not detected. No abnormality was detected in laboratory tests. Since our patient did not have symptoms that could indicate infection, such as high fever and chills, and no abnormality was detected in laboratory tests, no causative microorganism research was performed. In the brain MRI was depicted a lesion in the left cavernous sinus, which was hypointense in T1- and hyperintense in T2- sequence, compatible with cavernous sinus thrombosis (Figure 1A). In the brain MR-angiography, a left internal carotid artery occlusion was detected and that the left anterior cerebral artery and middle cerebral artery were filling through the anterior communicating artery (Figure 1B). In addition, in the neck CT-angiography, the left internal carotid artery was found thrombosed along the entire tracing by starting from the proximal part, and no flow was observed (Figure 1C). In the brain MR-venography, an advanced decrease in the calibrations was detected depending on the partial thrombosis of the left internal jugular vein, sigmoid sinus and transverse sinuses (Figure 1D).

According to the patient, when he was 5 years old, he was referred to an external center with complaints of headache and fever, and was first diagnosed with sinusitis and then meningitis. The patient received antibiotic treatment for 2 months, and after this, the patient developed “double vision”. During this period, the patient had developed a posture of looking by turning his head and neck to the opposite side in order to see the objects single. It was understood that ophthalmological surgical treatment was applied for the extraocular muscle weakness detected in the patient, and after this treatment, no complaints were observed in the patient for 11 years. When the patient reached the age of 17, he developed a pain starting from the left half of the neck, radiating to the left half of the head and face, and to the left eye. At the age of 20, the complaints of difficulty in looking outward and “double vision” in the left eye of the patient recurred, and these complaints continued for 5 years. At the age of 25, the patient was diagnosed with ophthalmic venous thrombosis and underwent ophthalmic surgery for the second time. Two years after this operation, the patient’s complaint of “double vision” was completely resolved.

The patient was evaluated in detail by the Department of Infectious Diseases and Clinical Microbiology and Deapartment of Interventional Radiology. As a result of the ‘multidisciplinary expert consultation’, the final diagnosis of the patient was made as “left abducens nerve palsy permanent sequelae of Lemierre Syndrome”. Anticoagulant therapy with Coraspin 100 mg/day per oral treatment and analgesic therapy was administrated. In the 1st, 6th and 12th months follow-ups of the patient there was no frontal headache complaint. In the neurological examination performed during the follow-ups; no other pathological finding was detected in the left eye other than ‘lateral gaze restriction’.

DISCUSSION

The incidence of Lemierre syndrome (LS) is estimated to be 1 case per 1 million annually\(^1,8\). Among the reasons for this low
incidence, the difficulties in diagnosing LS can be accounted due to both the fact that LS is a less well-known syndrome by clinicians and the multisystemic clinical course of the syndrome. The fact that a case of LS was not reported in the literature between 1950 and 1960 caused this disease to be called as "forgotten disease". In 1970s, it was observed that LS cases reported in the literature tended to increase depending on the developments in diagnostic imaging techniques. In 2008, Hagelskjær Kristensen and Prag reported 3.6 cases per 1 million people per year. In 2019, Nygren and Holm compared the cases between 2010-2013 and 2014-2017 and also emphasized that its incidence increased from 1 case per 1 million of people to 1.7 cases per year, and this increase was statistically significant. In addition, it was also reported that the incidence of F. necrophorum infections increased from 2.9 to 5 cases.

**Natural history and updated diagnostic criteria**

The first patient with F. necrophorum infection was reported in 1900. In 1936, 20 cases with postanginal septicemia showing a fatal course were reported by Andre Lemierre, who nominated the disease. The symptoms observed in LS clinic such as sore throat ache, neck swelling, and sepsis were described in detail in this study. The clinical triad of LS, which includes oropharyngeal infection, F. necrophorum bacteremia, and internal jugular vein thrombosis, is a hallmark of the disease. In 2008, Hagelskjær Kristensen and Prag reported 3.6 cases per 1 million people per year. In 2019, Nygren and Holm compared the cases between 2010-2013 and 2014-2017 and also emphasized that its incidence increased from 1 case per 1 million of people to 1.7 cases per year, and this increase was statistically significant. In addition, it was also reported that the incidence of F. necrophorum infections increased from 2.9 to 5 cases.

**Natural history and updated diagnostic criteria**

The first patient with F. necrophorum infection was reported in 1900. In 1936, 20 cases with postanginal septicemia showing a fatal course were reported by Andre Lemierre, who nominated the disease. The symptoms observed in LS clinic such as sore throat ache, neck swelling, and sepsis were described in detail in this study. The clinical triad of LS, which includes oropharyngeal infection, F. necrophorum bacteremia, and internal jugular vein thrombosis, is a hallmark of the disease.
thrombosis (IJV) was described by Vogel and Boyer in 1980. In this description, the presence of at least two parameters was considered enough to diagnose LS, provided that only one of F. necrophorum bacteremia and IJV thrombosis were detected. The causative microorganisms, which have a high potential to cause tissue necrosis, advance from the primary infection focus to the lateral pharyngeal space, where they are mostly located in the IJV via the lymphatics. In this localization, after ulceration and abscess formation, the causative microorganism invades the adjacent vascular structures in the head and neck region and it causes septicemia course along with the IJV thrombophlebitis and/or venous thrombosis within 1 to 3 weeks. A number of invasion mechanisms were reported in the literature, which state that the hematogenous pathway – via the tonsillar vein, the lymphatic pathway through the jugular lymphatic system, and the local neighborhood pathway – were also responsible for the spread of the causative microorganism to the IJV. In particular, in-vitro studies showed that F. necrophorum, which enters into the venous structure, activates platelets by producing leukotoxin and causes thrombus formation. In addition, it was observed that the exotoxin produced by F. necrophorum increased the production of tumor necrosis factor-α, which is responsible for inflammation in the clinical picture of LS. As a result, a multisystemic infection picture occurs as a result of the metastatic spread of the septic emboli to the distant organs. The most exposed organ to the septic embolisms are the lungs and they often present with pulmonary thromboembolism. However, it may develop in the septic arthritis, osteomyelitis, pericarditis, meningitis and hepatic abscesses as a result of the metastatic infection.

However, many LS cases in which IJV thrombophlebitis was not observed after an oropharyngeal infection and metastatic lesions were detected in distant organs, only with F. necrophorum bacteremia, were also reported in the literature. On top of that, in 2014, Riordan et al. and Olson et al. revised LS diagnostic criteria and reported that the presence of IJV thrombophlebitis was not essential. The authors described that the presence of a history of oropharyngeal angina in the previous 4 weeks and the detection of F. necrophorum in the blood culture would be enough for the diagnosis of LS in the patients with distant organ lesions. Similarly, a case report of LS with oropharyngeal Fusobacterium infection in which the infection spread to adjacent air sinuses, followed by cavernous sinus thrombosis, superior ophthalmic vein thrombosis, and meningitis was reported by Dasari et al. Here, it was assumed that the causative microorganism caused bacteremia and septic emboli from this focus after spreading from the oropharyngeal region to the adjacent sinuses. It was reported that the main factors responsible for the fulminant course of LS were sepsis and pulmonary thromboembolism.

Central nervous system involvements

Papers reporting central nervous system (CNS) involvement caused by LS are summarized in Table 1. In LS case reviews, observed after 2010, it was reported that the CNS involvement due to LS was lesser than other organ involvement (1.9%, 3.6% and 4.9%). This occurred due to the fact that the IJV was located more inferiorly than the CNS and to the reverse flow. However, thrombosis of the sigmoid sinus, cavernous sinus and/or other intracranial venous sinuses secondary to LS were also reported in the literature. Similarly, cavernous sinus thrombosis and internal carotid artery (ICA) cavernous segment partial thrombosis were determined in our case with the IJV total occlusion. The complaint of diplopia observed in the history in our case was caused by abducens nerve palsy secondary to the cavernous sinus thrombosis.

Although Fusobacterium meningitis is a rare observed complication secondary to LS, it is a poor prognostic sign. Riordan et al. reported that meningitis due to the Fusobacterium ssp or other anaerobic bacteria was observed in only 3 (1.3%) LS cases when they examined the data of 222 cases between 1970 and 2007. Kupppalli et al. analyzed the data of a total of 91 LS cases between 1974 and 1999, reporting that Fusobacterium meningitis picture was observed in 7 (7.7%) LS cases as the most common CNS complication. These patients aged 5 to 26 years also had subdural empyema, venous sinus thrombosis, cranial nerve palsies, carotid and cerebral artery stenosis. From these, 3 patients had recovered, and the sequelae of different cranial nerve palsies were reported to be permanent in 3 patients. In this study, recurrence was observed in 1 patient, as in our case. Similarly, in the case of LS with Fusobacterium meningitis reported by Dasar et al., the patient was discharged with the residual findings such as abducens nerve palsy and diplopia, which we observed in our case.

Another LS complication characterized by the residual cranial nerve palsies is cavernous sinus thrombophlebitis (CST) followed by thrombosis picture. The cavernous sinuses, which have a high degree of vascularity, are highly sensitive structures especially in the head and neck region due to localized infection-induced septic embolism. The CST picture still has a high mortality rate despite current antimicrobial treatments. It is caused by the retrograde flow of IJV thrombosis into the intracranial dural...
venous sinuses. Additionally, in the literature was reported that the air sinus infections such as maxillary, paranasal, ethmoidal and sphenoidal sinuses cause CST with the venous spread. Involvement of the anatomical structures within the cavernous sinus and adjacent to the sinus constitutes the main clinical presentation of the disease. Although the CST is often accompanied by the meningitis, the epidural/subdural empyema, cerebritis, cerebral abscess, ICA stenosis and cerebral infarction can also be observed less frequently. In the CST clinic picture, high fever, frontal headache, ocular pain, and periorbital edema are frequently accompanied by the limitation of eye movements and diplopia, which is developed secondary to the ocular cranial nerve palsies. Dasari et al. and Shibuya et al. also reported LS cases in which Fusobacterium meningitis and cavernous sinus thrombosis were observed together. They found the importance of early diagnosis in the cavernous sinus thrombosis, which can have a fatal course, was particularly emphasized, and they reported that the initiation of antibiotic and anticoagulant treatment as early as possible significantly affected prognosis of the disease. It is also very important to investigate the primary focus in LS cases complicated by the cavernous sinus thrombosis and to plan surgical intervention in the cases with chronic sinusitis and oropharyngeal abscess.

In 2009, Karkos et al. reviewed 114 cases of Fusobacterium-induced thrombophlebitis, between 1950 and 2007, and reported the overall CNS involvement rate as 30%, including cavernous, transverse, and sigmoid sinus thrombosis. In this study, the rate of ophthalmic complications, including paralysis of the 3rd, 4th and 6th cranial nerves innervating the extraocular muscles, was reported to be 5%.

Clinical manifestations and complications
LS clinic aspects usually starts with the complaint of sore throat, which is a common finding of the oropharyngeal infections such as pharyngitis and tonsillitis. High fever can be observed in addition to other nonspecific symptoms such as vomiting, fatigue and weight loss approximately 1 week after the onset of this localized infection in the primary focus. After, a neck pain, mostly unilateral, and swelling in the neck, and to a lesser extent, trismus findings are developed. In cases complicated by septic pulmonary thromboembolism, the chest pain and shortness of breath dominate the clinical presentation. In addition to all these complaints, the patients with LS diagnosis often are referred to the emergency department with the systemic sepsis findings and shock.

In a review conducted in 2020 on 27 patients diagnosed with LS between 2009 and 2019, it was reported that the ophthalmic complications were detected in 88.9% of the cases. In these cases, there was limitation of...
extraocular muscle movements due to paralysis of the 3rd, 4th and 6th cranial nerves and diplopia among the most common complaints. They reported IJV thrombosis in 81.5%, cavernous sinus thrombosis in 70.4%, diplopia due to 6th cranial nerve palsy in 50%, and decreased visual acuity in 29.6%26. The cases complicated by the partial or total thrombosis of the cavernous, sigmoid, and other intracranial venous sinuses can show an asymptomatic course, as well as a symptomatic course ranging from the cranial nerve palsy to the venous infarctions27.

Diagnosis: laboratory and radiological parameters
Investigation of the diagnostic criteria such as radiological imaging of IJV thrombosis, showing F. necrophorum in blood cultures and detecting multisystemic metastatic infected lesions is a detailed and long process. The fact that the defined diagnostic criteria are not fully met and the disease has a multisystemic course are the most important issues that make the diagnosis difficult in LS. Delayed diagnosis causes late initiation of the treatment and a two-fold increase in mortality28. In this context, the most important issue in the diagnosis of LS is the high clinical suspicion that should be shown in patients with oropharyngeal infection. Especially, in case of persistent high fever observed in early stages of the disease, skepticism should be treated and further research should be done29.

In the early stages of the disease, nonspecific sore throat depending on the oropharyngeal infection and infectious mononucleosis findings such as Leukocytosis, C-reactive protein (CRP) and Erythrocyte sedimentation rate (ESR) elevation are observed in the laboratory. Especially in this period, the blood cultures should be sent to determine the causative microorganism before starting antibiotic treatment so that LS cases are not overlooked. However, since F. necrophorum has long incubation period such as 5 to 8 days causes blood cultures to be seen as sterile in the early stages of LS, resulting in a false confidence picture for clinicians. Therefore, Polymerase chain reaction (PCR) test should also be performed to detect F. necrophorum in the cases with negative culture results in the early stages of the disease1,2,7,16.

The neck/jugular venous system Doppler USG and/or neck contrast-enhanced CT (computed tomography) to detect IJV thrombosis in cases with suspicion of LS, and thorax CT in the diagnosis of the septic pulmonary embolism are vital tests for the diagnosis1. In addition, the presence of pulmonary infiltrates on chest radiographs is a valuable finding. However, the contrast-enhanced CT and MRI are the most accurate diagnostic tools for detecting metastatic infected lesions and their localization such as venous thrombus formation, pulmonary embolism, osteomyelitis, arthritis and abscess (brain, kidney and liver abscess)1,2,25.

Antimicrobial therapy
In patients who are referred to the Emergency Department with pulmonary embolism and shock, supportive treatment for the respiratory and cardiovascular systems should be planned first. The mortality rate in the patients who do not receive appropriate antibiotic treatment during this period until definitive diagnosis is around 90%-24. Rapid diagnosis and initiation of antibiotic treatment as soon as possible is the most important factor to reduce morbidity and mortality in LS cases23,25. Therefore, the treatment with the broad-spectrum antibiotics such as Ceftriaxone, which is also effective against the anaerobic bacteria, should be started until F. necrophorum is identified in the blood cultures, especially in the patients with significant swelling and tenderness in the neck, symptoms of sepsis, and high fever. This treatment should be continued for 4 to 6 weeks23,25. In addition, there are other antibiotic options that are effective against the anaerobic bacteria, such as ticarcillin-clavulanate, ampicillin-sulbactam, clindamycin and flagyl2. In cases with the peritonsillar abscess, high-dose intravenous penicillin treatment can also be preferred1. Where Fusobacterium strains are identified in the blood cultures, Metronidazole, which penetrates well into the CNS and has excellent antimicrobial effect, should be preferred. Johannessen et al. reported that a 98% success rate was achieved by using Metronidazole together with Carbapenem or Piperacillin/Tazobactam combination treatment for an average time of 1 month7.

Anticoagulation therapy
The anticoagulation treatment is still a controversial issue due to its potential risks such as bleeding in the treatment of jugular venous thrombophlebitis, intracranial vein and dural sinus thrombosis observed in LS24. In the review of Johannesen and Bodtgner7, 64% of the patients who received anticoagulant treatment were compared to 34% of the patients who did not receive anticoagulant treatment, and found no difference in mortality between two groups. On the other hand, in a prospective study conducted by Stam in 200525, the rate of recovery in the patients with the sinus thrombosis was 79% with the anticoagulation treatment with Heparin, whereas major morbidity was 5% and mortality was 8%. Riordan et al. suggested that 21 to 23% of the patients included in their study were treated with the anticoagulants, and consequently, the anticoagulant treatment should be used only in the cases where there is no response to the antibiotics and thrombus spreading continuously including the cerebral sinuses. Kupalli et al. emphasized that the cases with the cerebral sinus thrombosis such as IJV thrombosis and cavernous sinus thrombosis should be divided into subgroups first and then an aggressive treatment strategy including the anticoagulant treatment should be decided for these subgroups. However, it is observed that the views on the use of

---

Sarica FB, Kapanoglu K, Daltaban IS, Senel I, Karakoc ITE - Central Nervous System Involvements of the Lemierre Syndrome: Case Report and Mini-Review of the Literature

J Bras Neurocirurg 33 (3): 360-367, 2022
https://doi.org/10.22290/jbnc.2022.330301
the anticoagulant treatment gain more weight in the literature, as it facilitates the resolution of venous thrombosis and allows antibiotics to have a better penetration in septic embolisms.\textsuperscript{15,17,23}

**Surgical therapy**

The mortality rate in the localized infections such as necrotic abscesses, septic arthritis and empyema observed in LS and infected in the deep neck region is around 5%. Therefore, drainage of the infected lesions in the relevant localization is an important factor determining the prognosis of the disease.\textsuperscript{2,13} The surgical drainage of the abscesses detected in primary foci is also very important to provide better penetration of the antibiotics and better control of the infection.\textsuperscript{2,13} In this case, the surgical drainage of the abscess should be performed first and then the treatment with the broad-spectrum intravenous antibiotics should be continued. In these cases with excessive pulmonary secretion and severe shortness of breath, the respiratory support should be given by the intubation first. On the other hand, the surgical drainage should be preferred in the abscesses observed in the lateral pharyngeal space and retropharyngeal space. Similarly, in the treatment of the peritonsillar abscesses, the abscess drainage should be performed by the surgical intervention to prevent the airway obstruction that will be able to develop with the abscess enlargement, aspiration pneumonia that will be able to be developed as a result of the spontaneous abscess rupture, and the dissection of the abscess into the lateral retropharyngeal space. Both anaerobic and aerobic culture studies should be performed on the materials taken during the surgery.\textsuperscript{3} In addition, the cases who underwent multiple air sinus operations such as maxillary antrostomy, ethmoidectomy and sphenoidectomy to remove infected materials in the air sinuses were reported in the literature.\textsuperscript{17}

**Combination therapy**

In the review conducted by Dasari and Jha,\textsuperscript{26} 2020, it was reported that all three treatment methods were applied in 27 patients with LS diagnosed with the IJV thrombosis and cavernous sinus thrombosis. In this study, while 40.7% of the cases were treated with metronidazole and 25.9% with ceftriaxone antibiotic treatment, both anticoagulant and surgical treatment were applied in 51.8% of the cases.

**REFERENCES**


**CONCLUSION**

The reviews found in the literature showed a remarkable increase in the incidence of LS cases, especially in the last 15 years. This increase is thought to be due to more limited use of the antibiotic applications in patients with sore throat in recent years. Early diagnosis of the focus of the infection and “multidisciplinary treatment approach” are vital in Lemierre Syndrome cases. Thus, the focus of the infection can be eradicated with both surgical treatment and appropriate antibiotic treatment. The anticoagulant treatment indication and duration of the administration were still not standardized. In order not to overlook LS, which is less well-known by clinicians and shows a fulminant course, LS should be considered especially in patients with oropharyngeal infection and presenting a picture of the sepsis.
Case Report

Sarica FB, Kapanoglu K, Daltaban IS, Senel I, Karakoc ITE - Central Nervous System Involvements of the Lemierre Syndrome: Case Report and Mini-Review of the Literature


CORRESPONDING AUTHOR

Feyzi Birol Sarica, MD, PhD
Associate Professor
Faculty of Medicine, Giresun University
Department of Neurosurgery
Giresun, Turkey
E-mail: saricafb@gmail.com

Funding: nothing to disclose
Conflicts of interest: nothing to disclose

Informed consent statement: This article has been prepared in accordance with the principles of the Declaration of Helsinki. Informed written consent was obtained from the patient for publication of this report and any accompanying images.