

*Original article***Neurocovid-19: a senegalese cohort**

Neurocovid-19 : une cohorte sénégalaise

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Abstract

Introduction: Neurological manifestations during the course of covid-19 are rare and arise from two mechanisms, either invasion by the virus itself or post-infection complications. This study of 15 cases from Senegal shows the variety and severity of neurological involvement in covid-19.

Methodology: This is a prospective study from May 2020 to May 2021, in the different neurology departments of Senegal. It focused on the epidemiological, clinical, paraclinical, therapeutic and evolutionary characteristics of 15 cases of neurocovid-19. The study included patients who presented with neurological manifestations during or following a Covid-19 infection.

Results: Our cohort was composed of 15 cases, 8 men and 7 women, with a mean age of 49 years. We found 6 cases of encephalitis, 4 cases of acute polyradiculoneuritis, 3 cases of stroke, 1 case of peripheral facial palsy and 1 case of acute choreic movement. The forms of covid-19 were: severe (53.33%), mild (40%), moderate (6.67%). 11 patients (74%) had comorbidities: hypertension (32%), diabetes (11%), ischemic stroke (11%) were the most frequent. The median (IQR) time to neurological

manifestations after the first symptoms of covid-19 was 7 (2-14) days. Treatment was conducted with different drugs such as hydroxychloroquine, azithromycin, corticosteroids, anticoagulants and oxygenation among others. The median follow-up (IQR) was 14 (7-24) days with a high short-term mortality rate (5/15, 33.33%).

Conclusion: Our study, the most varied in sub-Saharan Africa to date, confirms that covid-19 can affect different parts of the nervous system and has a serious prognosis. Neurological manifestations occur most often post-infection and it would therefore be important to have as a perspective a neurocovid unit that will take care of the short-, medium- and long-term sequelae of patients affected by covid19 which has so far given us many surprises.

Keywords: Covid19; Neurocovid; Encephalitis; Guillain-Barré; Stroke, Senegal.

Résumé

Introduction : Les manifestations neurologiques au cours du covid-19 sont rares et proviennent de deux mécanismes, soit une invasion par le virus lui-même, soit des complications post infectieuses. Cette étude faite au Sénégal à propos de 15 cas montre la variété

et la gravité des atteintes neurologiques au cours du covid-19.

Méthodologie : Il s'agit d'une étude prospective de mai 2020 à mai 2021, dans les différents services de neurologie du Sénégal. Elle portait sur les caractéristiques épidémiologiques, cliniques, paracliniques, thérapeutiques et évolutives de 15 cas de neurcovid-19. Dans cette étude ont été inclus des patients qui présentaient des manifestations neurologiques au cours ou à la suite d'une infection à COVID-19.

Résultat : Notre cohorte était composée de 15 cas, 8 hommes et 7 femmes, avec un âge moyen de 49 ans. Nous avons retrouvé 6 cas d'encéphalite, 4 cas de Polyradiculonévrites aiguës syndrome de Guillain-Barré, 1 cas de syndrome de Miller Fisher, 3 cas d'accident vasculaire cérébraux, 1 cas de paralysie faciale périphérique et 1 cas de mouvement choréique aigu. Les formes du covid-19 retrouvaient été : sévère (53,33%), bénigne (40%), modérée (6,67%). 11 patients (74%) présentaient des comorbidités : l'HTA (32%), le diabète (11%), l'AVCI (11%) étaient les plus fréquentes. Le délai médian (IQR) des manifestations neurologiques après les premiers symptômes du covid-19 était de 7 (2-14) jours. Le traitement a été conduit avec différents médicaments tels que l'hydroxychloroquine, l'azithromycine, les corticoïdes, les anticoagulants et l'oxygénation entre autres. Le suivi médian (IQR) a été de 14 (7-24) jours avec un taux élevé de mortalité à court terme (5/15, 33,33%).

Conclusion : Notre étude, la plus variée en Afrique sub-saharienne à ce jour, confirme que le covid-19 peut atteindre les différentes parties du système nerveux et à un pronostic grave. Les manifestations neurologiques surviennent le plus souvent en post-infection et il serait donc important d'avoir comme perspective une unité de neurocovid qui prendra en charge les séquelles à court, moyen et long terme des malades atteints de la covid19 qui nous réserve jusqu'à présent bien des surprises.

Mots-clés : Covid19 ; Neurocovid ; Encephalite ; Guillain-Barré ; AVC, Sénégal.

Introduction

Covid 19 disease caused by the SARS-CoV-2 coronavirus has reached pandemic proportions since December 2019 and the African continent has not been spared. As the pandemic has progressed, neurological manifestations [1] have been reported that result either from direct invasion by the virus or from an autoimmune mechanism. These can be severe, with encephalitis, stroke, acute transverse myelitis, Guillain-Barré syndrome and others. [2-3]. Their early diagnosis and management is a major challenge.

The objective of this article is to share the Senegalese experience on the neurological manifestations of Covid-19.

Methodology

This is a prospective study concerning patients received and hospitalised for Covid-19 in the different neurology departments (CHNU Fann and CHNU Pikine) of Senegal between May 2020 to May 2021. Patients with neurological manifestations during COVID-19 infection defined by at least one of the following three criteria were included:

- A biological diagnosis by RT-PCR positive for Covid-19.
- Recent infection by ELISA serology.
- A typical Covid-19 pneumonia appearance as ground glass areas on chest CT.

Patients who did not give their consent, those whose neurological manifestations were not attributable to covid19 and those with isolated headache, arthralgia, myalgia and anosmia were not included.

All patients were examined and followed by the same neurology team. Depending on the clinical presentation, the appropriate complementary examinations were systematically requested (CT scan and/or cerebral MRI, electroencephalogram and electroneuromyogram, cerebrospinal fluid study,

etc). For the diagnosis of Covid-19, a nasal swab was performed in 14 patients, covid-19 serology by ELISA in 3 patients and specific viral genome research by RTPCR in the CSF of SARS-CoV-2 in 7 patients (63%). 11 patients (73.3%) had undergone a thoracic CT scan.

We studied the epidemiological, clinical, paraclinical, therapeutic and evolutionary characteristics of the different patients.

Results

General results

Our cohort consisted of 15 patients, 8 men (53%) and 7 women. The average age of the patients was 49 years (extremes 7 and 85 years).

We found 6 cases of encephalitis, 4 cases of peripheral neuropathy (3 Guillain-Barré syndrome, 1 Miller Fisher syndrome), 3 cases of stroke (2 haemorrhage, 1 case of cerebral ischemia), 1 case of peripheral facial paralysis and 1 case of acute choreic syndrome (Figure 1).

The median (IQR) time to neurological manifestations after the first symptoms of covid-19 was 7 days (2-14). 11 patients (74%) had a comorbidity: hypertension (32%) and diabetes (11%) were the most common.

The main neurological symptoms were motor deficit (46.66%), headache (46.6%), sensory deficit (33.33%), cranial nerve damage (33.33%), proprioceptive ataxia (33.33%) consciousness disorders (33.3%), osteotendinous areflexia (26.6%), convulsions (26.6%), behavioural disorders (26.6%), meningeal syndrome (6.6%) and choreic movements (6.6%).

(Table 1)

The main extra-neurological symptoms were fever (100%), dry cough (66.6%), respiratory distress (53.33%), arthralgia (46.6%), sore throat (33.3%) and anosmia (20%). (Table 2)

For the diagnosis of Covid-19, nasal swabs were taken in 14 patients and were positive in 9 (60%). Covid-19 serology by ELISA was performed in 3 patients (of the 5 negative patients) and showed IgM+ / IgG -

evidence of recent infection in 3 patients. 11 patients (73.3%) had undergone chest CT scans, which showed typical Covid-19 pneumonitis in the form of «ground glass areas» (Figure 2). Seven patients (63%) were tested for the specific viral genome by RTPCR in the CSF for SARS-CoV-2 and were negative.

The forms of covid-19 found in our patients were severe (53.33%), mild (40%) or moderate (6.67%).

Treatment was conducted with various drugs such as hydroxychloroquine, azithromycin, corticosteroids, anticoagulants and oxygenation among others.

The median follow-up (IQR) was 14 days (7-24) with a high short-term mortality rate (33.3%). Six patients (40%) improved and 4 patients (26.7%) retained sequelae.

b. Specific results

Encephalitis

Encephalitis was diagnosed in 6 patients (40%) with a median age of 54 years (range 7 and 85 years) and a sex ratio (M/F) of 0.17. 4 patients (66%) were comorbid with hypertension (n=3) and HIV-1 (n=1). Covid-19 was severe (50%) or mild (50%).

The median (IQR) time to neurological manifestations after the first symptoms of covid-19 was 7.5 days ((6-14). The main neurological symptoms were convulsions (50%), behavioural disturbances (50%), disturbed consciousness (33.3%), cranial nerve damage (33.3%), headache (50%), hemiplegia (16.6%) and anosmia (13.3%). These manifestations occurred in a context of fever (100%), dry cough (83.3%) and respiratory distress (50%).

Brain imaging was normal in 4 patients (66.6%) and pathological in 2 others showing diffuse oedema in one and signal abnormalities at the mesencephalic and parietal level in the other (figure 3). Two patients had a normal EEG in one and a global slowing of the tracing with the presence of diffuse pseudo-periodic complexes predominating in the fronto-temporal region in the other [4].

Cerebrospinal fluid was clear, with an albumin-cytological dissociation and a mean hyperproteinorachy of 0.75g/l (0.55-0.89) and a normal glycorachy. The bacteriological, mycotic,

virological and parasitological study of the CSF was sterile.

Nasal swabbing, performed in all patients, was positive in 3 cases (50%) and negative in 3 others. The covid-19 serology by ELISA, performed in the 3 negative patients, showed IgM+ / IgG -. The electrolyte and metabolic balance was normal in all patients. All our patients had a positive C-reactive protein at an average of 57.8 mg/l. In one of our patients a co-infection with *Klebsiella Pneumoniae* was found during the nasopharyngeal swab.

Treatment was conducted with corticosteroids (83.3%), azythromycin (83.3%), antiepileptics (50%) and hydroxychloroquine (16.6%). The median follow-up (IQR) was 18 days (4-26) with clinical improvement in 5 patients (83.3%), 1 of whom had motor sequelae. One patient died.

Stroke

Stroke (2 haemorrhage and ischemic) was diagnosed in 3 men with a median age of 45 years (range 29 and 59 years). 2 patients (66.6%) were comorbid with hypertension (n=1) and sickle cell disease (n=1). The median time to neurological manifestations after the first symptoms of covid-19 was 5 days (extremes 2 and 7 days). The Covid-19 form was benign.

The main neurological signs were headache (100%), hemiplegia (100%), sensory disorders (66.6%), aphasia (66.6%) and consciousness disorders (66.6%). The main extra-neurological symptoms were fever (100%) and dry cough (33.3%). Brain imaging revealed a temporoparietal haematoma (figure 4), a pontine haematoma and total sylvian ischaemia (figure 5) in all three patients. In the patients with a CVA, the angiographic explorations (cerebral CT and MRI) did not reveal any arteriovenous malformation or cerebral venous thrombosis. The patient with DVA had an electrocardiogram with disturbed cardiac repolarisation and a fresh apical thrombus on cardiac ultrasound. cardiac MRI could not be performed due to the patient's deterioration. Chest CT showed a specific «ground glass» appearance of covid 19 in all patients. The anti-nuclear antibody, anti-native DNA and anti ECT assays were negative. The blood count

was normal. Nasal swabs were negative in all patients and the virus was not found in the CSF . The median follow-up (IQR) was 19 days (12-32) with one patient dying and the other two patients recovering with motor sequelae.

Polyradiculoneuropathy

Acute polyradiculoneuropathy was found in 4 men with a median age of 65.5 years (range 55-80 years). Three patients had Guillain-Barré syndrome and one had Miller-Fisher syndrome. Three patients (75%) were comorbid with diabetes (n=2) and hypertension (n=1). The median time to neurological manifestations after the first symptoms of covid-19 was 7.5 days (extremes 5 and 14 days). Covid-19 was severe in all cases (100%). The main neurological signs were osteotendinous areflexia (100%), sensory disturbances (75%), proprioceptive ataxia (75%), tetraplegia (50%), paraplegia (25%) and ophthalmoplegia (25%), all in the context of fever (100%), dry cough (100%) and respiratory distress (100%) and anosmia (75%).

Chest CT showed a specific «ground glass» appearance of covid 19. Nasal swabs were positive in 3 cases (75%). The median follow-up (IQR) was 14 days (range 5 and 24) with a mortality rate of 50%. Two other patients recovered without sequelae.

Other

A 39-year-old female patient with no previous history had a peripheral facial palsy 7 days after a benign Covid. She was grade 4 according to the House-Brackmann classification and the Freyss test was 14. The ENMG showed an axonal type of involvement, of moderate severity with a blink reflex with a prolonged R2 latency on the right and left. The patient improved under physiotherapy and corticosteroids.

Another patient, 59 years old, had developed acute choreic movements 3 days after a severe covid. Neuroradiological and biological investigations could not be made of her rapid death.

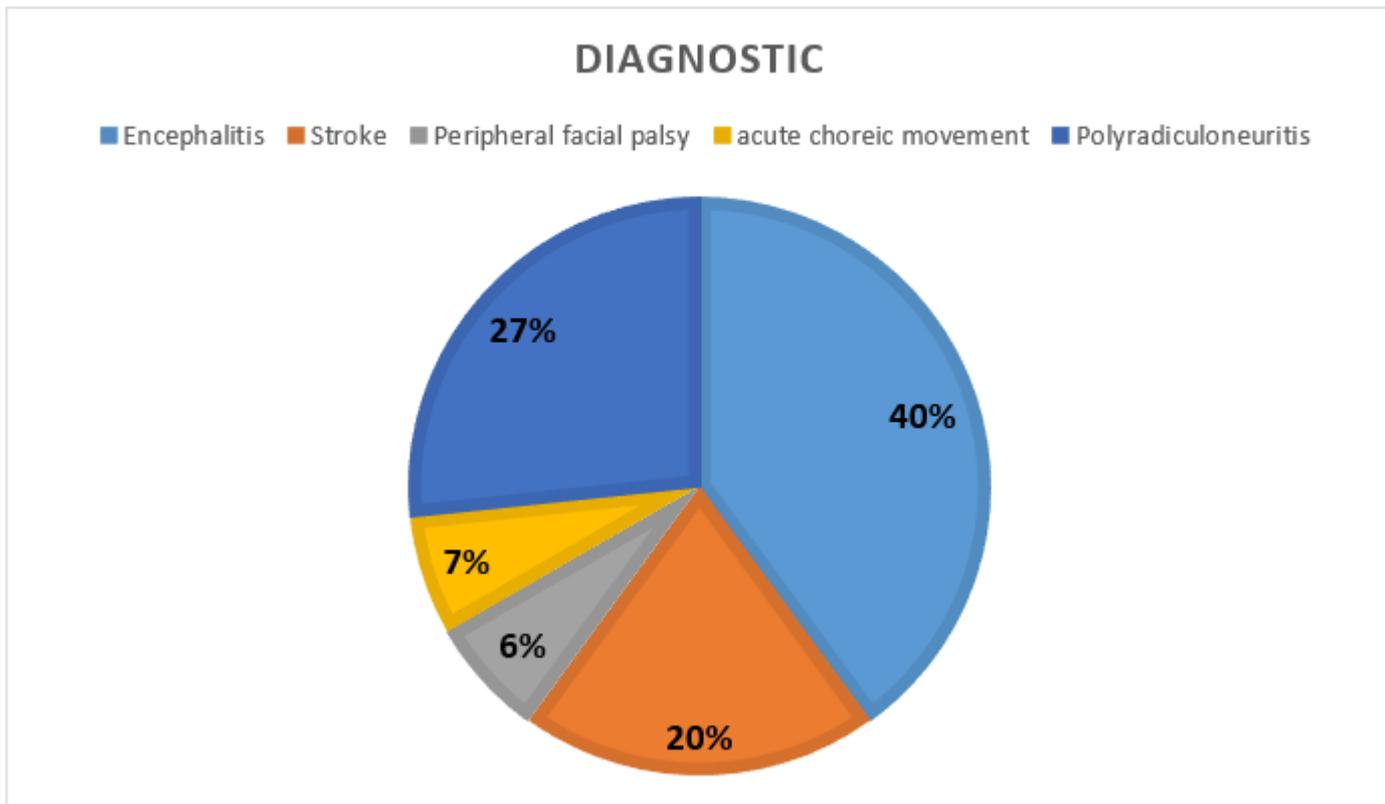


Figure 1: Distribution by neurological diagnosis

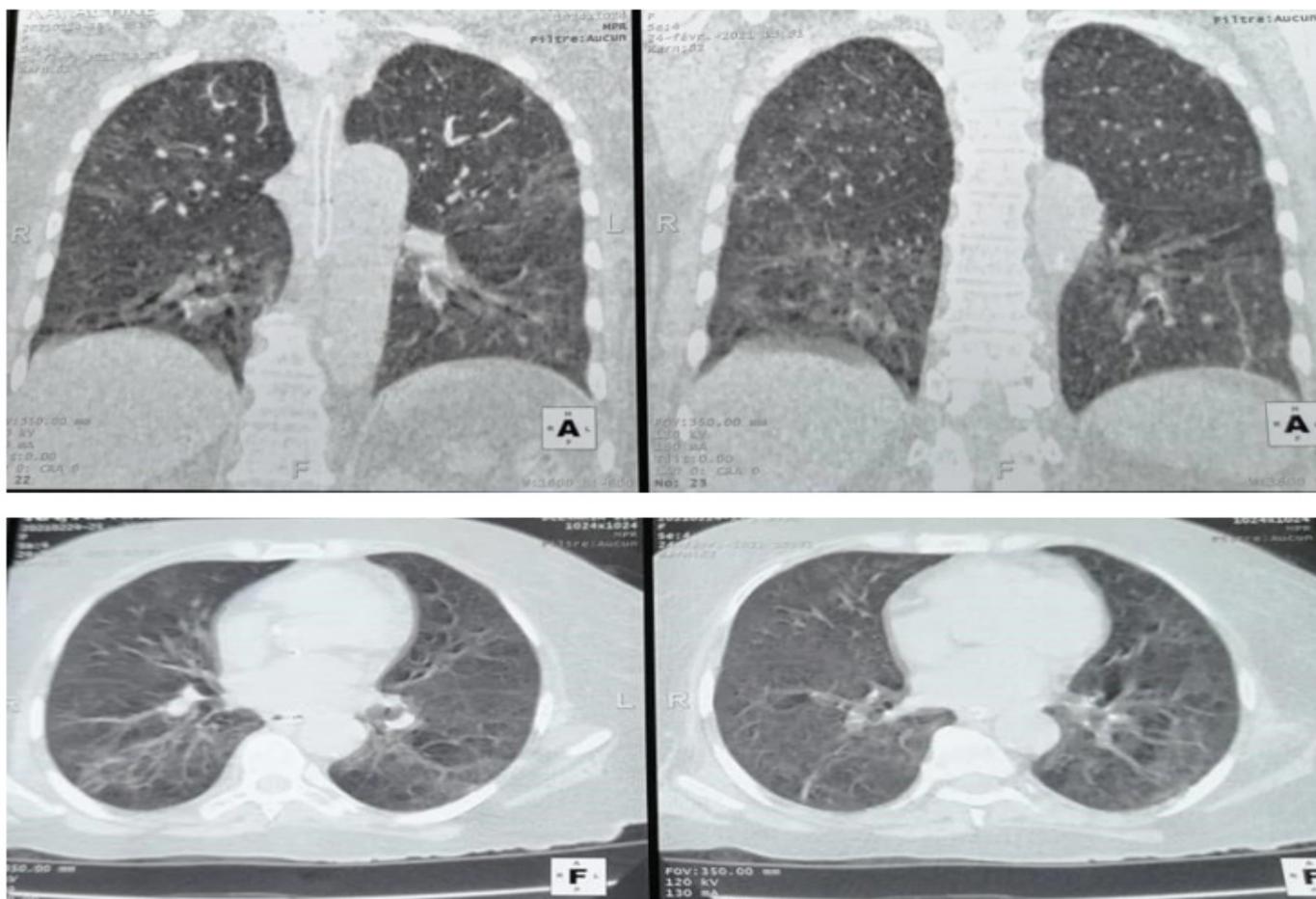


Figure 2: Chest CT: bilateral ground glass appearance.

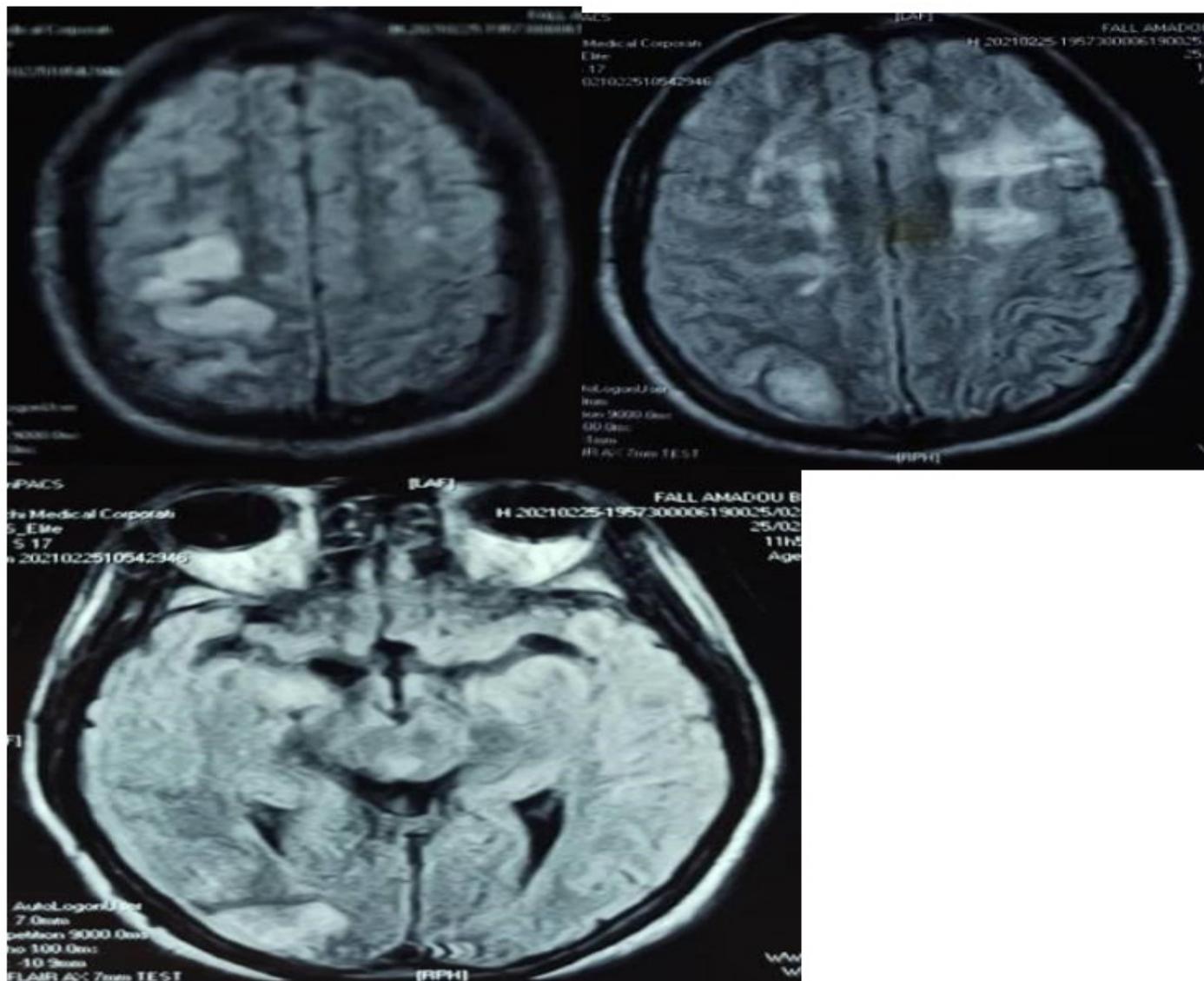


Figure 3: T2 flair and T2* hypersignal in the left parietal, right parieto-occipital and mesencephalic areas.

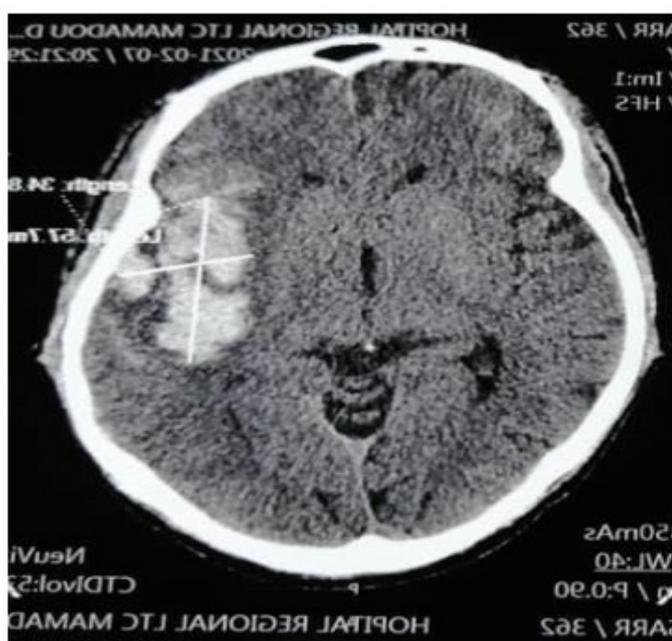


Figure 4: Cerebral CT: Left temporal parietal haematoma.

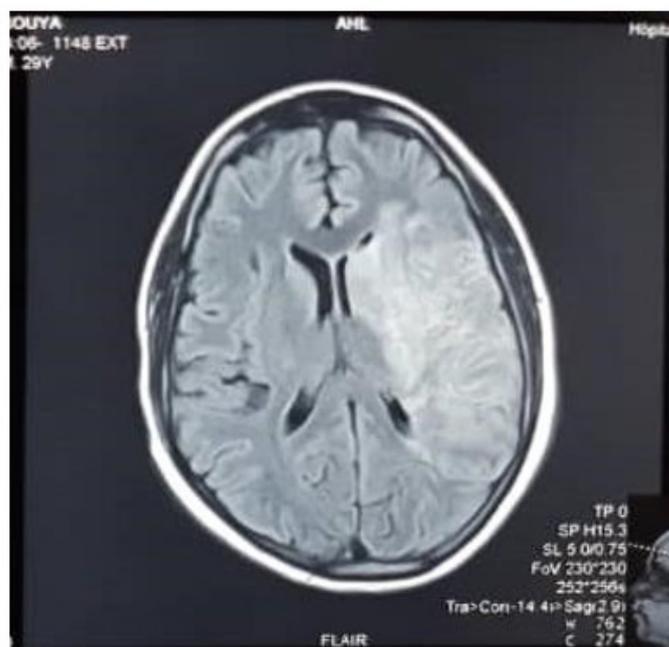


Figure 5: Brain MRI: left total sylvian ischaemia with haemorrhagic remodelling within it.

Table I: Distribution of neurological signs by frequency

Neurological sign	Neurological sign	%
Motor deficit	7	46,66
□ Hemiplegia	3	20
□ Tetraplegia	3	20
□ Paraplegia	1	6,66
Sensory deficit	5	33,33
□ Superficial	4	26,66
□ Deep	1	6,66
Ataxia	5	33,33
Osteotendinous areflexia	4	26,6
HTIC	2	13,33
Convulsive seizures	4	26,66
□ Focus	1	6,66
□ Secondary generalized focus	1	6,66
□ Generalized	2	13,33
Disorders of consciousness	5	33,33
Behavioural problems	4	26,66
Cranial nerve damage	5	33,33
□ Oculomotor III, IV, VI	3	20
□ VII	2	13,3
Abnormal choreic movements	1	6,66
Meningitis	1	6,66

Table II: Distribution according to the frequency of clinical signs covid-19

Clinical sign Covid-19	Number of patients	%
Fever	15	100
Cough	10	66,66
Arthralgia/myalgia	7	46,66
Respiratory distress SpO ₂ <90	8	53,33
Headache	7	46,66
Sore throat	5	33,33
Anosmia / Ageusia	3	20
Dyspnoea SpO ₂ ≥90	1	6,66

Table III: Distribution of neurological signs by frequency

Type	Neurological signs	Extra-neurological signs
Encephalitis	Seizures (50%) Behavioural problems (50%) Consciousness disorders (33.3%) Cranial nerve damage (33.3%) Hemiplegia (16.6%)	Fever (100%) Dry cough (83.3%) Respiratory distress (50%) Headache (50%) Anosmia (13.3%)
Stroke	Hemiplegia (100%) Sensory disorders (66.6%) Language impairment (66.6%) Consciousness impairment (66.6%).	Fever (100%) Headaches (100%) Sore throat (66.6%) Dry cough (33.3%)
Polyradiculoneuropathy	Osteotendinous areflexia (100%) Tetraplegia (50%) Paraplegia (25%) Sensory disorders (75%) Proprioceptive ataxia (75%) Ophthalmoplegia (25%)	Fever (100%) Dry cough (100%) Respiratory distress (100%) Anosmia (75%)
Peripheral facial paralysis	Peripheral VII nerve damage	Arthralgia, fever, sore throat
Acute chorea	Acute choreic movement	Respiratory distress, dry cough, fever

Table IV: Epidemiological, clinical, paraclinical and evolutionary summary of the 15 cases

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7
Age	66	50	7	15	39	59	58
Gender	F	M	F	F	F	F	F
Comorbidities	HTA-AVCI	HIV-1	-	-	-	HTA	HTA
Clinical sign Covid	Respiratory distress, cough, fever	Arthralgia, headache, fever	Fever, cough, headache, arthralgia	Respiratory distress, cough, fever	Arthralgia, fever, sore throat	Respiratory distress, dry cough, fever	Respiratory distress, dry cough, fever,
Timeframe (days)	7	14	6	8	7	3	9
Severity COVID	Severe	Benign	Benign	Severe	Benign	Severe	Severe
Neurological sign	Focal seizure Disorder of consciousness	HTIC Hemiparesis Nerve damage II Psychomotor agitation	Generalized tonicclonic seizures	Generalized convulsive seizures Consciousness disorder SG=7/15	Peripheral VII nerve damage	Acute choreic movement	Behavioural disorder
Lumbar puncture	Clear Leu: 2 Gly: 0.40 Prot: 0.89 ↑	Clear Leu: 3 Gly: 0.45 Prot: 0.77 ↑	Clear Leu: 0 Gly: 0.42 Prot: 0.76 ↑	Clear Leu: 0 Gly: 0.40 Prot: 0.69 ↑	Clear Leu: 2 Gly: 0.45 Prot: 0.27	Not done	Clear Leu: 2 Gly: 0.59 Prot: 0.55
Imaging	CT: No recent lesions	cMRI: bilateral right parieto-occipital and left mesencephalic hypersignal	cMRI: normal EEG: global slowing of the trace with the presence of diffuse pseudoperiodic complexes predominating in the frontotemporal region	CT: diffuse cerebral oedema MRI: not done	ENMG= left axonal PFP of moderate severity with a blink reflex that shows a prolonged R2 latency on the right and left	Not done	Brain MRI: normal EEG: normal
Diagnosis	Encephalitis	Encephalitis	Encephalitis	Encephalitis	PFP	Acute chorea	Encephalitis
Evolution	Improvement	Improvement/ sequelae	Improvement/ sequelae	Deaths	Improvement	Deaths	Improvement

	Patient 8	Patient 9	Patient 10	Patient 11	Patient 12	Patient 13	Patient 14	Patient 15
Age	71	80	60	55	59	47	29	85
Gender	M	M	M	M	M	M	M	F
Comorbidities	-	Diabetes	AH, DVT	Diabetes	HTA AVCI	Smoking Ethyl	Sickle cell SC	HTA
Clinical sign covid	Respiratory distress arthralgia, anosmia, dry cough, fever	Fever, chills, sweating, dry cough, respiratory distress	Fever, dry cough, anosmia, respiratory distress	Headache, asthenia, respiratory distress arthralgia, anosmia, dry cough, fever	Fever, dry cough, headache, sore throat	Arthralgia, fever, dry cough, dyspnea, headache, sore throat	Fever, cough, headache, arthralgia,	Headache, Fever
Timeframe (days)	5	10	5	14	7	2	5	2
Severity	Severe	Severe	Severe	Severe	Moderate	Benign	Benign	Benign
COVID Neurological sign	Tetra paresis Tactile and thermoalgesic hypoesthesia, osteo-tendinous areflexia, proprioceptive ataxia	Osteotendinous areflexia paresis Proprioceptive ataxia	Tetra paresis areflexia osteotendinous Tactile sensory deficit ataxia proprioceptive	Ataxia Ophthalmoplegia Osteotendinous areflexia	Tetraparesis, nerve damage III, dysarthria	Hemiplegia, consciousness disorder, superficial sensory disorder, motor aphasia, focal seizure	Hemiplegia, consciousness disorder, superficial sensory disorder, motor aphasia	Disturbance of consciousness, meningeal syndrome
Lumbar puncture Paraclinical	Clear Leu: 2 Gly: 0.51 Prot: 1.62↑	Clear Leu: 3 Gly: 0.77 Prot: 1.87↑	Clear Leu: 3 Gly: 0.48 Prot: 1.19↑	Clear Leu: 3 Gly: 0.88 Prot: 2.02↑	Not done	Clear Leu: 0 Gly: 0.55 Prot: 0.52	Clear Leu: 0 Gly: 0.45 Prot: 0.65↑	Clear Leu: 3 Gly: 0.54 Prot: 0.87↑
Diagnosis Evolution	ENMG: not done SGB Deaths	ENMG: AIDP SGB Deaths	ENMG: AIDP SGB Improvement	Brain CT: normal ENMG: not done SMF Improvement	cGPS Angio: Pontic hematoma AVCH Improvement / sequelae	cTd + cIMRAngio: Temporal parietal hematoma AVCH Improvement/ sequelae	cMRI: total sylvian ischemia ETT: apical thrombus ECG: repolarisation disorder AVCI Deaths	Brain CT: normal Encephalitis Improvement

M*=Male F*=Female leu *= leukocyte gly*= glycorrhaply Prot*= proteinorrhaphy cTc*= Cerebral CT scan cMRI*= Cerebral Magnetic Resonance Imaging Miller Fisher syndrome DVA*=Ischaemic stroke HTA*=Hypertension PFP*=Peripheral facial palsy EEG*=Electroencephalogram ENMG*=Electroneuromyogram DVT*=Deep vein thrombosis

Discussion

It is clearly established that SARS-CoV-2 is a systemic disease with a brain tropism. The entry of SARS-CoV into human host cells is primarily mediated by a cellular receptor, angiotensin converting enzyme 2 (ACE2). Since 2002, studies on samples from SARS-CoV patients have demonstrated the presence of SARS-CoV particles in the brain, where they were almost exclusively found in neurons. [5] Genomic sequences have been found in autopsies of the brains of SARS-CoV patients. [6] The genomic sequence is similar between SARS-CoV and SARS-CoV-2, particularly at the level of binding receptors. This may lead to SARS-CoV and

SARS-CoV-2 sharing the ACE2 receptor. This could be the reason why SARS-CoV and SARS-CoV2 could invade the same place in the human brain. [7] The average age of our patients, 49 years, was lower than that of E. Meppiel (65 years) [8] and P. Agarwal (+65= 31.9%) [9] but close to that of Yannick F. (54.6 years) [10]. This could be explained by the youth of the African population. The male predominance (53%) of our cohort is superimposed on the others with an average ranging between 52 and 68% [8-9-10]. Concerning comorbidities, the report of the GCS-NeuroCOVID Consortium and the ENERGY Consortium [11] found arterial hypertension (58%), diabetes (35%), neurological history (23%) and immunodepression (17%).

The severe form of Covid-19 was in the majority at 41.1% in Yannick F. [10] to 45.2% in Meppiel E. [8] and 53.84% in our series. These data could be an indication of a correlation between the severity of the covid-19 form and the appearance of neurological signs. In their meta-analysis of 3053 patients, Sherry H.-Y. Chou et al, [11] reported that the most frequent neurological signs were headache (38%) and anosmia (27%). In the cohort of Meppiel E. [8], 30.2% of patients had encephalopathy, in P. Agarwal,[9] 27% had headache and 44% had myalgia, and in Yannick F. [10], headache accounted for 39.0%, myalgia 35.6% and anosmia 11.9%.

Our study is unique in that it excluded patients who consulted for isolated headache, arthralgia, myalgia and anosmia.

The rarity of our cases is superimposed on that of the literature with 2.65% of strokes found in Yannick F. [10]. E. Meppiel [8] found 9.5% encephalitis and 6.8% Guillain-Barré syndrome. P. Agarwal [9] found only 0.7% with stroke and 0.5% with seizures. Sherry H.-Y. Chou et al, [11] reported 3% cases of stroke and <1% cases of encephalitis. Of these 4 reviews, cases of polyradiculoneuropathy were only found in Meppiel E. [8]. Samir Abu-Rumeileh et al [12], in a meta-analysis, reported 73 cases of polyradiculoneuropathy with a male predominance, an age of onset of 55 years and a 77.4% AIDP. Our patients were older at 66.5 years and all had IDA. As in our study, the diagnosis of Miller Fisher syndrome was rare (5.4%).

Isabel Siow et al, conducted a meta-analysis [13] of 138 cases of encephalitis. Their average age was 59.4 years, whereas ours was younger (34.5 years) with 2 pediatric cases. Our 2 adult patients had the same comorbidities (hypertension and immunodepression). The majority of patients with encephalitis had a severe form of covid (83.8% and 50% for us) and the mortality rate is high with 13.4% for them and 25% for us.

Nannoni S. et al, [14] in a meta-analysis of 108571 patients followed for Covid-19, 1912 (1.4%) had a stroke. The average age was 65.3 years, older than ours (45 years). The predominance was male (62.4%) similar to our cases which were exclusively male. COVID-19 patients developing acute cerebrovascular disease, compared with those who did not, were older (pooled median difference ¼ 4.8 years; 95% CI: 1.7-22.4), more likely to have hypertension (OR ¼ 7.35; 95% CI: 1.94-27.87), diabetes mellitus (OR ¼ 5.56; 95% CI: 3.34-

9.24), coronary heart disease (OR ¼ 3.12; 95% CI: 1.61-6.02) and severe infection (OR ¼ 5.10; 95% CI: 2.72-9.54). The most common event was ischaemic stroke (87.4%); intracerebral haemorrhage was less common (11.6%). For ischaemic stroke, large vessel involvement was more common than lacunar vessel

involvement (OR $\frac{1}{4}$ 2.73; 95% CI: 1.63-4.57). Our study found more cases of haemorrhage, however the size of our cohort is small. Most often, patients had both Covid-19 and stroke symptoms during their course, which is similar to our series with a delay of 8.8 days for Nannoni S. and 4.6 days for our series between Covid-19 signs and stroke onset.

Abnormal movements are rarely seen in the literature and one case of acute chorea with a normal brain MRI was found by Muhammad Hassan et al, [15]. In comparison, our patient could not be further investigated due to her rapid death in the intensive care unit. Luca Codeluppi et al [16] in a retrospective study concluded that there was a higher frequency of facial palsy during the COVID-19 epidemic compared to the same period in the previous year; 21% of patients with facial palsy had active or recent symptoms consistent with SARSCoV-2 infection, suggesting an excess risk of facial palsy during or after the COVID-19 epidemic.

Ariane Lewis' review [17] showed that only 17 cases or 6% were positive for Sars-CoV-2 using CSF PCR. In our series no patient was CSF positive. Although the understanding of neurotropic mechanisms remains an important area of research, these results seem to confirm the fact that neurological complications associated with covid-19 are not related to direct viral neuroinvasion. These results demonstrate the diagnostic difficulty of neurocovid, and therefore greater attention is needed to understand viral post-infectious processes.

The mortality rate was high in the different studies: 12.6% [8], 15% [11] and 33.33% in our series. Our higher mortality rate could be explained by the difficulty of managing severe forms of covid-19 and neurocovid19 due to the limited technical facilities and resources available.

Conclusion

Neurological manifestations, although uncommon, occur most often post infection. The distinction and recognition of these signs is important for the

diagnostic and therapeutic management of patients. They can easily be masked during severe intensive care mainly dominated by pulmonary involvement. In the wake of this study, it would be important to have a neurocovid unit in place to manage the short-, medium- and long-term sequelae of patients with covid19 in sub-Saharan Africa.

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Conflict of interest : None

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