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Facteurs de risques périopératoires de complications du sujet drépanocytaire en Martinique

Prann Joachim

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Facteurs de risques périopératoires de complications du sujet drépanocytaire en Martinique

THESE D'EXERCICE EN MEDECINE

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Prann JOACHIM

Examineurs de la thèse :

Mr RESIERE Dabor

Mme LOKO Gylna

Mr DECAESTECKER Antoine

Mr BARBOTIN LARRIEU François

Mme ROLLE Amélie

Professeur, Président du jury

Docteur

Docteur

Docteur

Docteur, Directrice de thèse

Le Président de l'Université des Antilles : Michel GEOFFROY
Doyen de l'UFR Santé des Antilles : Suzy DUFLO
Vice-Doyen de l'UFR Santé des Antilles : Christophe DELIGNY

Professeurs des Universités - Praticiens Hospitaliers

Antoine ADENIS	Epidémiologie, économie de la santé et prévention CH de CAYENNE Tél. : 0594 39 50 50
Véronique BACCINI	Hématologie CHU de Guadeloupe Tel : 05 90 89 10 10
Pascal BLANCHET	Chirurgie Urologique CHU de Guadeloupe Tel : 05 90 89 13 95
Sébastien BREUREC	Bactériologie & Vénérologie CHU de Guadeloupe Tel : 05 90 89 12 80
Laurent BRUREAU _	Urologie CHU de Guadeloupe Tel : 05 90 89 10 10
André CABIE _	Maladies Infectieuses CHU de Martinique Tel : 05 96 55 23 01
Philippe CABRE _	Neurologie CHU de Martinique Tel : 05 96 55 22 61
Raymond CESAIRE _	Bactériologie-Virologie-Hygiène option virologie CHU de Guadeloupe Tel : 05 96 89 10 10
Nadège CORDEL _	Dermatologie & Vénérologie CHU de Guadeloupe Tel : 05 90 89 10 10
Pierre COUPPIE _	Dermatologie CH de CAYENNE Tel : 05 94 39 53 39

Professeurs des Universités - Praticiens Hospitaliers

CHERET Antoine _	Thérapeutique-Médecine de la douleur CHU de Guadeloupe Tel : 05 90 89 10 10
Michel DE BANDT _	Rhumatologie CHU de Martinique Tel : 05 96 55 20 00
Bertrand De TOFFOL _	Neurologie CH de CAYENNE Tél. : 0594 39 50 50
Magalie DEMAR - PIERRE	Parasitologie et Infectiologie CH de CAYENNE Tel : 05 94 39 53 09
Christophe DELIGNY _	Médecine Interne CHU de Martinique Tel : 05 96 55 22 55
Félix DJOSSOU _	Maladies infectieuses et tropicales CH de CAYENNE Tel : 05 94 39 50 50
Moustapha DRAMÉ _	Épidémiologie, Économie de la Santé CHU de Martinique Tel : 05 96 55 20 00
Suzy DUFLO _	ORL – Chirurgie Cervico-Faciale CHU de Guadeloupe Tel : 05 90 93 46 16
Narcisse ELENGA _	Pédiatrie CH de CAYENNE Tel : 05 94 39 77 37
Loïc EPELBOIN _	Maladies infectieuses CH de CAYENNE Tel : 05 94 93 50 00
Karim FARID _	Médecine Nucléaire CHU de Martinique Tel : 05 96 55 21 67
Jocelyn INAMO _	Cardiologie CHU de Martinique Tel : 05 96 55 23 72 - Fax : 05 96 75 84 38
Hatem KALLEL _	Médecine intensive-réanimation CH de CAYENNE Tél. : 0594 39 50 50
Annie LANNUZEL _	Neurologie CHU de Guadeloupe Tel : 05 90 89 14 13

Professeurs des Universités - Praticiens Hospitaliers

Harold MERLE _	Ophtalmologie CHU de Martinique Tel : 05 96 55 20 00
Mathieu NACHER _	Epidémiologie, Economie de la Santé et Prévention CH de CAYENNE Tel : 05 94 93 50 24
Rémi NEVIERE _	Physiologie CHU de Martinique Tel : 05 96 55 20 00
Olivier PARANT _	Gynécologie-Obstétrique CHU de Guadeloupe Tel : 05 90 89 10 10
Stéphanie PUGET _	Neurochirurgie CHU de Martinique Tel : 05 96 55 20 00
Chantal RAHERISON-SEMJEN	Pneumologie, Addictologie CHU de Guadeloupe Tel : 05 90 89 10 10
Dabor RESIERE _	Thérapeutique-médecine de la douleur CHU de Martinique Tel : 05 96 55 20 00
Pierre-Marie ROGER _	Maladies infectieuses et tropicales CHU de Guadeloupe Tel : 05 90 89 10 10
François ROQUES _	Chirurgie Thoracique et Cardiovasculaire CHU de Martinique Tel : 05 96 55 22 71
Jean ROUDIE _	Chirurgie Digestive CHU de Martinique Tel : 05 96 55 21 01 - Tel : 05 96 55 22 71
Maturin TABUE TEGUO _	Médecine interne : Gériatrie et Biologie du vieillissement CHU de Guadeloupe Tel : 05 90 89 10 10
André-Pierre UZEL _	Chirurgie Orthopédique et Traumatologie CHU de Guadeloupe Tel : 05 90 89 14 66
Magaly ZAPPA _	Radiologie et imagerie médicale CH de CAYENNE Tel : 05 94 93 50 00

Professeurs des Universités Associés - Praticiens Hospitaliers

Stéphane AMADEO _

Psychiatrie

CHU de Martinique

Tel : 05 96 55 20 00

Jacqueline DELOUMEAUX-TYNDAL _

Épidémiologie, économie de la santé et prévention

CHU de Guadeloupe

Tel : 05 90 89 10 10

Papa Ngalgou GUEYE _

Médecine d'Urgence

CHU de Martinique

Tel : 05 96 55 20 00

Hossein MEHDAOUI _

Médecine intensive-réanimation

CHU de Martinique

Tel : 05 96 55 20 00

Stéphane PLawecki

Chirurgie Orthopédique

CHU de Martinique

Tel : 05 96 55 20 00

Patrick PORTECOP _

Médecine d'urgence

CHU de Guadeloupe

Tel : 05 90 89 10 10

Marc PUJO _

Médecine d'Urgence

CH de CAYENNE

Tel : 05 94 93 50 00

Maître de Conférences des Universités - Praticiens Hospitaliers

Cindy BERAL _

Ophtalmologie

CHU de Guadeloupe

Tél. : 0590 89 10 10

Romain BLAIZOT

Dermatologie-Vénérologie

CH de CAYENNE

Tel : 05 94 93 50 00

Moana GELU-SIMEON

Gastroentérologie hépatologie

CHU de Guadeloupe

Tel : 05 90 89 10 10

Maître de Conférences des Universités - Praticiens Hospitaliers

Clarisse JOACHIM-CONTARET

Epidémiologie, économie de la santé et prévention

CHU de Martinique

Tel : 05 96 55 20 00

Marie-Laure LALANNE-MISTRIH

Nutrition

CHU de Guadeloupe

Tel : 05 90 89 13 00

Amélie ROLLE

Anesthésie Réanimation

CHU de Guadeloupe

Tel : 05 90 89 10 10

Emmanuelle SYLVESTRE

Biostatistique, Informatique médicale et

Technologie

CHU de Martinique

Tel : 05 96 55 20 00

**Fritz-Line VELAYOUDOM épouse
CEPHISE**

Endocrinologie

CHU de Guadeloupe

Tel : 05 90 89 13 03

Maître de Conférences

Yoann GARNIER

Biologie Moléculaire et Cellulaire

INSERM

Maître de Conférences des Universités Associé - Praticiens Hospitaliers

Maïder FIRPION-COPPRY

Hygiène hospitalière

CHU de Guadeloupe

Tel : 05 90 89 10 10

Professeur des Universités de Médecine Générale

Jeannie HELENE-PELAGE

Médecine Générale

CHU de Guadeloupe / Cabinet libéral

Tel : 05 90 84 44 40

Professeur Associé de Médecine Générale

Franciane GANE-TROPLENT

Médecine générale
Cabinet libéral
Tel : 05 90 20 39 37

Maître de Conférence des Universités de Médecine Générale

Philippe CARRERE

Médecine générale
Cabinet libéral

Maître de Conférence Associé de Médecine Générale

KANGAMBEGA-CHATEAU-DEGAT Walé

Médecine générale
Cabinet libéral

Franck MASSE

Médecine générale
Cabinet libéral

Professeur émérite

Eustase JANKY

Gynécologie-Obstétrique

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RESUME

Rationnel de l'étude :

La drépanocytose est une maladie génétique héréditaire caractérisée par des anomalies de l'hémoglobine. C'est la maladie génétique la plus fréquente dans le monde ainsi qu'en France, avec une prévalence plus élevée dans les régions d'Afrique subsaharienne, du Moyen-Orient, de l'Inde et des Caraïbes. La drépanocytose, malgré les avancées médicales, reste associée à une morbi-mortalité significative, notamment en période périopératoire.

Objectif :

L'objectif de cette étude est d'améliorer la prise en charge anesthésique et chirurgicale des patients drépanocytaires en identifiant plus précisément les facteurs de risques de complications périopératoires en Martinique.

Patients et Méthodes :

De janvier 2020 à mars 2023, nous avons réalisé une étude rétrospective au Centre Hospitalier de Mangot Vulcin en Martinique, dans un service spécialisé en drépanologie. Tous les patients drépanocytaires (SS, SC, Sβ) nécessitant une intervention chirurgicale, quel que soit leur âge ou leurs comorbidités, ont été inclus dans l'étude. Le critère de jugement principal de l'étude est la survenue de complications postopératoires dans les 30 jours suivant la chirurgie. Nous avons ensuite recherché, parmi les caractéristiques des patients, les variables significativement associées à la survenue de ces complications.

Résultats :

Après le screening initial, nous avons identifié 141 patients drépanocytaires potentiels. Parmi ceux-ci, 2 patients présentaient des facteurs d'exclusion et ont été par conséquent exclus de l'étude. Suite à des données manquantes, 31 autres patients ont également été exclus. En fin de compte, 108 patients drépanocytaires en période périopératoire ont été inclus dans l'étude. Après analyse des résultats, aucun facteur de risque de complication périopératoire n'a été retrouvé de manière significative.

Conclusion :

Cette étude n'a pas identifié de facteurs de risque de complications périopératoires significatifs chez les patients drépanocytaires en Martinique. Cependant, elle suggère une prise en charge périopératoire efficace en Martinique, avec peu de complications. Des recherches ultérieures et des études prospectives sont nécessaires pour approfondir ces constatations et guider les protocoles cliniques futurs.

ABSTRACT

Background:

Sickle cell disease is a hereditary genetic disorder characterized by abnormalities in hemoglobin. It is the most common genetic disease worldwide as well as in France, with a higher prevalence in regions of sub-Saharan Africa, the Middle East, India, and the Caribbean. Despite medical advancements, sickle cell disease remains associated with significant morbidity and mortality, especially in the perioperative period.

Purpose:

The aim of this study is to enhance the anesthetic and surgical management of sickle cell patients by more precisely identifying the risk factors for perioperative complications in Martinique.

Methods:

From January 2020 to March 2023, we conducted a retrospective study at the Hospital Center of Mangot Vulcin in Martinique, in a department specialized in sickle cell disease. All sickle cell patients (SS, SC, S β) requiring surgical intervention, regardless of their age or comorbidities, were included in the study. The primary endpoint of the study is the occurrence of postoperative complications within 30 days following the surgery. We then looked for patient characteristics that were significantly associated with the occurrence of these complications.

Results:

After the initial screening, we identified 141 potential sickle cell patients. Of these, 2 patients had exclusion factors and were consequently excluded from the study. Due to missing data, 31 other patients were also excluded. In the end, 108 perioperative sickle cell patients were included in the study. After analyzing the results, no risk factors for perioperative complications were found to be significant.

Conclusions:

This study did not identify any significant risk factors for perioperative complications in sickle cell patients in Martinique. However, it suggests effective perioperative management in Martinique, with few complications. Further research and prospective studies are needed to delve deeper into these findings and guide future clinical protocols.

LISTE DES ABREVIATIONS

ACS : Acute Chest Syndrom

VOC: Vaso-Occlusive Crisis

UHCM : University Hospital Center of Martinique

ENT : Ear nose throat

SCD : Sickle Cell Disease

DRCI : Innovation and Clinical Research

VAS : Visual Analog Scale

PACU : Post-Anesthesia Care Unit

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Introduction

Sickle cell disease (SCD), also known as sickle cell anemia, is a hereditary genetic disorder characterized by abnormalities in hemoglobin. Originating in Africa and India and subsequently spread due to migratory movements, it represents a major public health challenge globally (1).

It is the most common genetic disease worldwide as well as in France, with a higher prevalence in regions of sub-Saharan Africa, the Middle East, India, and the Caribbean (2,3).

It affects over five million people and accounts for approximately 300,000 births each year.

The latest available figures from 2015 indicate a prevalence of one affected child for every 1,736 births in France, one affected child for every 765 births in the Paris region, and one affected child for every 499 births in the overseas departments (4).

In Martinique, a French overseas territory located in the Caribbean, the frequency of the sickle cell trait (Hb AS) is estimated at 8% (5). This heightened prevalence is partly due to the colonial past marked by the slave trade and slavery, which introduced the sickle cell gene into the local population (6). The majority of the Martinican population consists of Afro-Caribbeans (over 70%). Other ethnic groups include Indo-Caribbeans, individuals of European origin, Middle Eastern descent, and other backgrounds (5).

The clinical consequences of sickle cell disease, such as vaso-occlusive crises, hemolytic anemia, infections, and organ-related complications, are responsible for significant morbidity among Martinican sickle cell patients. In Martinique, hospitalizations related to sickle cell disease account for approximately 10% of all pediatric hospitalizations and 5% of all adult hospitalizations (7).

Moreover, sickle cell disease generates a substantial socio-economic burden, with direct and indirect health costs estimated at several million euros each year (8).

Even today in France, due to its complications, the life expectancy of sickle cell patients remains lower than that of the general population, with a median between 40 and 50 years (3).

Despite medical advancements, sickle cell disease remains associated with significant morbidity and mortality, especially in the perioperative period. Indeed, the complexity of sickle cell disease, given its multi-systemic nature and the variability in clinical expression, poses a unique challenge in treating sickle cell patients requiring surgical intervention (9).

A variety of perioperative risk factors have been explored in previous studies, including age, gender, type of surgery, outpatient care, sickle cell status (SS, SC, etc.), type of anesthesia, preoperative hemoglobin level, the use of vasopressors, and many other variables (9–23).

However, the conclusions remain variable, with no clear identification of major and uniform risk factors. These conflicting results can be attributed to several limitations of existing studies, including the predominance of retrospective over prospective studies, limited cohorts, and generally low levels of evidence.

It is also worth noting that the sickle cell population is diverse, and genetic, environmental, and socioeconomic differences can influence the risk profile. For instance, studies conducted in Martinique concerning perioperative management are non-existent, creating a significant gap in understanding the perioperative management of these patients.

Hence, conducting a more in-depth and local study is essential.

The aim of this study is to improve the anesthetic and surgical management of sickle cell patients by more precisely identifying the risk factors for perioperative complications in Martinique.

A better understanding of these factors could lead to more personalized and effective management, thereby reducing the morbidity and mortality associated with surgical interventions.

METHOD

This retrospective study was carried out on patients from the Mangot Vulcin Hospital Center in Martinique, in a department specializing in drepanology. The study was approved by the Directorate for Innovation and Clinical Research (DRCI), in particular by its IRB branch, thus ensuring compliance with ethical principles. Patients included in the study were informed by letter of their potential participation in the study, with contact details provided in case more information was needed or if they decided to oppose inclusion.

Data collection was carried out retrospectively, from patient records treated from January 2020 to March 2023. Patients included in the study were identified from their medical records using the keywords "sickle cell disease" and "surgery". All sickle cell patients (SS, SC, S β) requiring surgical intervention, regardless of their age or comorbidities, were included in the study. Excluded patients were those refusing to participate in the study, or having changed their mind after previously accepting inclusion, or already having one of the complications sought before surgical management, that is to say an ongoing vaso-occlusive crisis or acute thoracic syndrome under treatment, a recent pulmonary embolism or deep vein thrombosis under anticoagulation. Patients with sickle cell traits (heterozygosity) were not considered in the study.

A wide range of variables was collected from medical records, including clinical and biological characteristics, medical history, specifics related to sickle cell disease, and preoperative, intraoperative, and postoperative information.

Data collection on post-operative complications was performed by examining the medical records following the surgical intervention.

The primary outcome of the study is the occurrence of postoperative complications within 30 days following surgery.

If a patient was readmitted to the hospital after discharge, or had a complication within the 30 days following surgery, this complication was noted and included in the data.

A complication was defined as one of the following variables: pulmonary embolism, deep vein thrombosis, post-operative infection acquired in service (pulmonary, septicemia, septic shock...), surgical reoperation, vaso-occlusive crisis, acute chest syndrome, myocardial infarction, stroke, death (*Table 1bis. Definition of Acute chest syndrome*).

The statistical analysis will be carried out with a qualified statistician. The analysis will consist of descriptive analyses for all variables, as well as bivariate analyses to assess the relationships between each independent variable and the outcome. Variables with a P-value < 0.05 will be considered significant.

Given the retrospective nature of the study, the paper format of most of the records, and given the non-standardized nature of the pre-anesthetic consultation for these patients, many variables will

either not be searched by the practitioner or be lost. These missing data will be handled by the imputation method. In the case where the patient's record would have an excess of missing data, it would be excluded from the statistical analysis.

RESULTS

In total, 141 patients were screened at CHU of Martinique from January 2020 to March 2023 (*Figure 1. Flow chart*).

Two patients presented exclusion criteria as they already had, in the preoperative phase, one of the post-operative complications searched for: they exhibited a vaso-occlusive crisis, had undergone a recent bloodletting, or had a transfusion exchange in the three months preceding the surgical intervention. These transfusion interventions were not carried out in anticipation of the surgery but were part of the regular management and monitoring of sickle cell patients.

31 patients were excluded due to a large number of missing data. These gaps were mainly due to data loss, given the retrospective nature of the study, and the fact that most of the information was in paper format or certain variables of interest had not been investigated by sickle cell doctors, anesthetists, or surgeons during preoperative preparation (no standardization of practices).

The final population of 108 sickle cell patients comprised about 56% of patients with SS sickle cell disease, 32% with SC sickle cell disease, and 12% with S beta-thalassemic sickle cell disease (*Table 1. Basic characteristics of SCD patients*).

The characteristics of the included population are very heterogeneous. It consisted of adults and minors, with 38% minors and 62% adults. The distribution by gender was almost equivalent, with nearly as many men as women. Despite a varied history of sickle cell-specific complications and multiple hospital visits for crises, our patients were on average young, 31 years old, and had few comorbidities.

The types of interventions performed on this population were predominantly abdominal surgeries (48%), followed by orthopedic and spinal surgeries (16%) and ENT (11%). Among these interventions, some are commonly performed in sickle cell patients, such as cholecystectomy or splenectomy. Most of the interventions were non-urgent and scheduled (86%). Few surgeries were performed on an outpatient basis. The majority of our patients were hospitalized in conventional services, with few immediate post-operative admissions to intensive care units (*Table 2. Perioperative management of SCD patients*).

The majority of the interventions were performed under general anesthesia (60%), while a smaller proportion was carried out under regional anesthesia. Finally, a number of cases benefited from mixed anesthesia (25%), combining both general and regional anesthesia.

All patients in our study were anemic, with a median hemoglobin of 10.

33% of them received perioperative transfusion. The use of vasopressors, mainly in the form of a few boluses of ephedrine or norepinephrine, was infrequent, concerning only 14% of cases. The use of noradrenaline was almost non-existent.

10% of patients encountered complications, the most common being vaso-occlusive crises (7%), followed by post-operative infection (3%) sometimes requiring surgical revision, and acute chest syndrome (2%). Only one case of death was recorded (Table 3. Outcomes of SCD patients).

After interpreting the results, no significant risk factors for perioperative complications in Martinique were found.

DISCUSSION

Our study population represents the diversity of everyday life, welcoming patients of all ages.

Our results may be in line with the current literature, which to date includes fewer than fifteen studies that have truly examined the perioperative risk factors of sickle cell patients as the main judgment criterion (11,13–23).

Of these studies, only 7 (11,13,15,17,18,20,21) were conducted prospectively, through cohorts or randomized controlled trials. Some of them had a limited number of participants.

Furthermore, these studies have different evaluation criteria and follow-up periods, taking place in diverse geographical territories, encompassing populations with different sickle cell phenotypes and thus different genetic and clinical expressions. Among the aforementioned prospective studies, some focus exclusively on pediatric or even obstetric populations (17), while others focus mainly on a specific type of surgery, such as abdominal, orthopedic, ENT, etc. Sometimes even on a specific procedure, like cholecystectomy. This adds even more complexity to the risk factors of sickle cell subjects.

The conclusions of these studies are often conflicting, and it's more common not to find any significant risk factors. However, some trends seem to emerge, and although the number of significant risk factors is limited, some of them appear more recurrently.

In our study, the number of recorded post-operative complications was around 10%. Interpreting this result is complex, as the incidence of these complications varies considerably in the current literature. Unlike the majority of studies on the subject which primarily focused on more specific populations and specific surgical areas, such as abdominal, orthopedic, or ENT surgery, we included a wider variety of surgeries. According to different studies, this variation can range from less than 5% to over 20% (9,13–15). There's no clear consensus on the incidence of these post-operative complications, emphasizing the importance of considering the specificity of surgical procedures when analyzing results.

The most commonly encountered complication was the vaso-occlusive crisis (7%), followed by post-operative infection (3%) and acute chest syndrome (2%).

A concordance with the existing literature is observed. Many studies report the vaso-occlusive crisis as the most common post-operative complication, with an incidence of around 6%, followed by acute chest syndrome (4%) and post-operative infections (12,15,24).

The acute chest syndrome (ACT), sometimes presented as the most frequent complication, probably has the broadest reported incidence variation, ranging from less than 1% to over 20% (23,24,24–27). This significant fluctuation may have several explanations. The pathophysiology of ACT is multifactorial. Retrospective studies have suggested that this complication might be favored by changes in ventilatory function post-operatively (16). A decrease in oxygenation, as well as

abnormalities in the ventilation-perfusion ratio, could increase the risk of pulmonary micro-infarction or infection in sickle cell patients.

In support of this notion, studies have reported an increased incidence of ACT following surgeries likely to cause post-operative ventilatory changes, such as thoracic or abdominal surgeries. *Wales et al.* showed that the syndrome manifested more often on the operated side, often preceded by atelectasis on that side.

This highlights that atelectasis might be a mechanism leading to acute chest syndrome.

Furthermore, *Wales et al.* emphasize that patients with post-operative acute chest syndrome often present with predominant radiographic involvement at the lower lung lobes.

In our study, only one death was recorded. This death was not related to a specific complication of sickle cell disease (sudden death from aneurysm rupture). This mortality rate is consistent with the existing data in the medical literature. Indeed, although SCD can increase the incidence of perioperative morbidity, surgery in patients with this condition is generally considered safe (16,25). Most studies report a mortality rate of around 1%, or even lower. This observation extends even to more complex procedures such as cardiac surgery with extracorporeal assistance (28,29).

In our study, abdominal surgery turned out to be the most frequently performed procedure, accounting for 48% of cases, followed by orthopedic and spinal surgery, with 16%, and ENT interventions, with 11%. The most common specific procedure was cholecystectomy, accounting for 21% of procedures. These results are in line with observations reported in the literature, where cholecystectomy appears as the most commonly performed operation (18,24).

Our study stands out for its unique exploration of potential variables as risk factors, even if they were ultimately not confirmed as such.

Among these, the antecedent of diabetes, splenectomy, and cholecystectomy had not been previously studied. This is also the case for preoperative biological indicators such as the S hemoglobin level, the C hemoglobin level, CRP, liver tests, and LDH. Our research also looked into the modality of outpatient surgery, which had not been previously explored, or admission to an intensive care unit for post-operative monitoring.

Furthermore, in the post-operative period, we also studied the variable of pain in the Post-Anesthesia Care Unit (PACU) and upon immediate admission to the service, specifically patients who required multimodal analgesia with heavy morphine titration in the recovery room or who had recurrent pains with a Visual Analog Scale (VAS) score greater than 3 rapidly in the ward and not relieved within the first 24 hours (*Table 2bis. Definition of « Pain » in PACU or Upon immediate admission to the service*).

The results of our study align with the literature with the absence of identified risk factors for complications concerning: gender, BMI, hypertension, chronic renal failure, platelet count, leukocyte count, ASA score, and perioperatively, peripheral oxygen saturation (typically in studies, saturation below 90% is compared to saturation above 90%) as well as the use of vasopressors perioperatively.

Our findings are consistent with the current literature, reflecting a nuanced approach to anesthesia in sickle cell patients. The choice between general and regional anesthesia should be carefully considered, based on the specific clinical needs of each case.

The impact of the anesthetic technique on specific sickle cell complications was initially a source of controversy. (15) *Koshi et al.* noted an association between the use of regional anesthesia and postoperative complications in their review of 1079 anesthetics. This study, which included various types of procedures including obstetrical interventions, did not control for the effect of the latter, which are more at risk of complications and for which regional anesthesia has been widely used.

Haber Kern et al. (18) in 1997, who found no correlation between the use of perioperative epidural anesthesia and postoperative complications in 364 cholecystectomies, demonstrate that there is no clear consensus. Most studies have not found more adverse effects among the regional anesthesia group.

Anesthetic techniques, whether general or regional, seem appropriate and safe (9,29–32). It is recommended to use general or regional anesthesia appropriately and thoughtfully when possible (12).

Our results support the absence of significant differences in postoperative complications between the different sickle cell genotypes (SS, SC, and beta-thalassemic). Although it seems that SS homozygous patients tend to have a more aggressive form of their disease ; the rates of postoperative complications specific to SCD are similar for SS and SC patients undergoing abdominal and orthopedic surgeries (15).

Comparing sickle cell genotypes is complex, relies on few high-level evidence studies, and faces challenges related to the variable distribution of genotypes in different territories. This situation complicates the comparison of different genotypes in studies, as the prevalence of some may be higher in certain regions, making a genotype underrepresented and thus influencing results.

No relationship was found between the level of hemoglobin F and the occurrence of complications. It is commonly accepted that a high level of hemoglobin F is associated with a protective clinical effect (33-35).

Regarding perioperative transfusion (exchange transfusion, simple transfusion, phlebotomy...), the literature seems quite controversial. Several studies have evaluated the merit of this practice to achieve specific goals such as reducing the level of hemoglobin S to less than 30% or targeting a total hemoglobin above 10 g/dL, without demonstrating the superiority of one strategy over another.

There seems to be no benefit to transfusion for low hemorrhagic risk surgeries, and transfusion, even outside of a surgical indication, is considered a safe and commonly performed practice.

As for intermediate or higher-risk surgeries, the results are mixed, as the majority of papers (36) show that there is no benefit to systematically transfusing preoperatively to reduce complications.

There are no official recommendations to date supporting systematic transfusion, however, one should not rule out transfusion, as significant anemia (hemoglobin below 7) is an exclusion criterion in many studies, and in others, constitutes a risk factor for morbidity and mortality.

The more invasive and major the surgery, the greater the risk of perioperative complications. However, in our study, no type of surgery is significantly associated with a perioperative complication in sickle cell patients. This observation is not in contradiction with current literature, as only in retrospective studies of low evidence level has it been proven that the type of surgery can be a perioperative risk factor (15). *Koshy et al.* had arbitrarily classified surgeries between mild and moderate risks, including in the moderate category abdominal surgery, orthopedic surgery, upper airway surgery (adenoidectomy, tonsillectomy), and obstetric surgery. They found that surgery classified as moderate risk led to more complications in sickle cell patients. However, among the few high-level evidence studies, it has not been clearly proven that the type of surgery is a perioperative risk factor.

The focus has primarily been on comparing the same surgery using different approaches, as in the case of abdominal surgery (splenectomy, cholecystectomy, appendectomy), examining the benefits of laparoscopic over open surgery. Even here, the literature remains controversial (11,13,18).

Two variables deserve special attention, as they are inconsistent with the literature: « the emergent nature of the surgery » and « the history of specific complications in the sickle cell patient in the year preceding the intervention ». Of the six prospective studies we identified, four looked at the emergent nature, and of these four, two stand out for their high level of evidence, being randomized, multicentric, interventional, and focusing on abdominal surgery: *Haberken et al.* (18), involving 364 patients of all ages, and *Snyder et al.* (11), involving 800 minors, both identifying the emergent nature as a significant risk factor.

While these two papers share methodological similarities in terms of the complications sought and the 30-day follow-up, comparing their results to ours is challenging. Given that they limited their studies to abdominal surgery, their findings cannot be generalized to all types of surgery.

Regarding the variable "history of specific complications in the sickle cell patient in the previous year", the 3 prospective studies identified (13,18,20) establish a significant association. Two of them, *the Hakerbern study* mentioned earlier and the *Vinchinsky study* (20), which is controlled and randomized, including 551 multicentric patients with an identical 30-day follow-up and covering a wide range of surgeries, suggest that the higher the number of complications in the previous year, the greater the risk. This difference with our results is likely due to a lack of statistical power, given our reduced sample size.

Our findings concerning age are inconsistent with the literature. The literature suggests that age is a key factor related to the manifestations of SCD, whether in a perioperative context or not. *Vinchisky et al.* (37) revealed that the severity of acute chest syndrome increases with age, reflecting the association between age and the clinical picture of sickle cell patients.

Age is predominantly found as a risk factor for perioperative complications in the literature, with an increasing trend as age advances (18,20).

Conversely, the paper by *Castro and al.* (21), which followed 3,751 sickle cell patients of all ages for 2 years, found that (except in children under 2 years) an increased incidence of acute chest syndrome is observed in younger subjects. However, these results should be interpreted with caution as the included patients were not undergoing surgical management. The authors also hypothesized a selection bias in interpreting their results. They suggest that patients with the most frequent and severe forms of ACS might be underrepresented as age advances, as they less frequently reach adulthood.

These observations underscore the importance of age as a factor influencing the pathogenicity of the sickle cell patient.

This study represents a significant contribution as the first exploration of perioperative risk factors for complications in sickle cell patients in Martinique.

The findings of this research could be relevant not only in Martinique but also for the entire French West Indies, including Guadeloupe, because of their historical, genetic, and phenotypic similarities. The methodological approach of this study follows the pattern of other papers. The follow-up duration, or for instance the investigation of the same specific sickle cell complications (such as vaso-occlusive crises, acute chest syndrome, pulmonary embolism, and other events) is relevant since these are the most common complications specific to this population. This approach facilitates comparisons with the literature and strengthens the credibility of its conclusions.

Choosing a diverse and unrestricted population (few exclusion criteria) proves relevant for clinical practice and the generalization of the conclusions. By encompassing a range of ages, types of sickle cell diseases and surgical procedures, this method more accurately represents the hospital reality within the CHU. The results become more directly applicable to the patients that clinicians encounter daily, allowing for better recommendations and standardization of care.

However, this inclusive approach also has limiting aspects.

Including a wide range of patients (SS, SC, SB, pediatric, type of surgery, etc.) may have diluted specific and subtle associations that could emerge in more homogeneous subgroups.

For example, the issue of pregnant women, while raising important considerations, could have implications on our results due to pathophysiological peculiarities. Thus, while this approach enhances clinical relevance and the generalization of results, it can also impair the detection of risk factors specific to particular subgroups.

This study has several limitations.

The limited sample size reduces the statistical power and the ability to identify existing associations.

The retrospective nature of the study as well as data losses. However, these data losses might not necessarily be detrimental to the study and could be more frequent in the absence of complications. Indeed, in the event of a complication, patients would likely have been directed to intensive care units, where monitoring is more frequent and reports are more detailed.

The lack of discovery of significant risk factors related to complications in this study carries a positive significance. The results suggest that any potential risk factors might be relatively infrequent within this population. It's crucial to note that the rates of complications observed during this study are notably low (compared to other studies in different territories (13)), which could reflect adequate perioperative care in Martinique despite the absence of a standardized protocol.

Conclusion

Within the framework of this study, we undertook research aiming to identify perioperative risk factors associated with complications in sickle cell patients in Martinique. Despite negative results, it's important to recognize the significant implications of our work.

The absence of a significant risk factor identified in this study does not entirely diverge from the existing literature, characterized by a variety of conflicting results in previous studies. Indeed, our results align with the general trend regarding the few clearly established risk factors in this population.

One of the strengths of this study lies in the diversity of our sample, encompassing patients of all ages, all forms of sickle cell disease, and all surgical procedures. However, the absence of significant risk factors can be partly explained by this diversity. A study more specific to certain subgroups could potentially reveal valuable associations.

Our results suggest that the perioperative care of sickle cell patients in Martinique is satisfactory, as evidenced by the low number of complications observed in our sample. This observation can be encouraging for practitioners and indicates that the quality of care in this context is positive.

Our results have implications that extend beyond the borders of our island, due to the historical, genetic, and phenotypic similarities with other regions of the French West Indies. These findings could be extrapolated to a regional scope that could benefit not only Martinique but also Guadeloupe and other neighboring islands.

Our study should not be considered the end of the exploration in this field. Future studies, with a larger prospective sample, are necessary to obtain more robust evidence. Moreover, the adaptation of care protocols based on the specific characteristics of each patient should be encouraged to improve clinical outcomes.

In the end, this study, despite its limitations, provides a foundational work and avenues to enhance the management of this vulnerable population while highlighting the need for continued research in this domain to continue improving care and clinical outcomes.

Figure 1 : Flow Chart

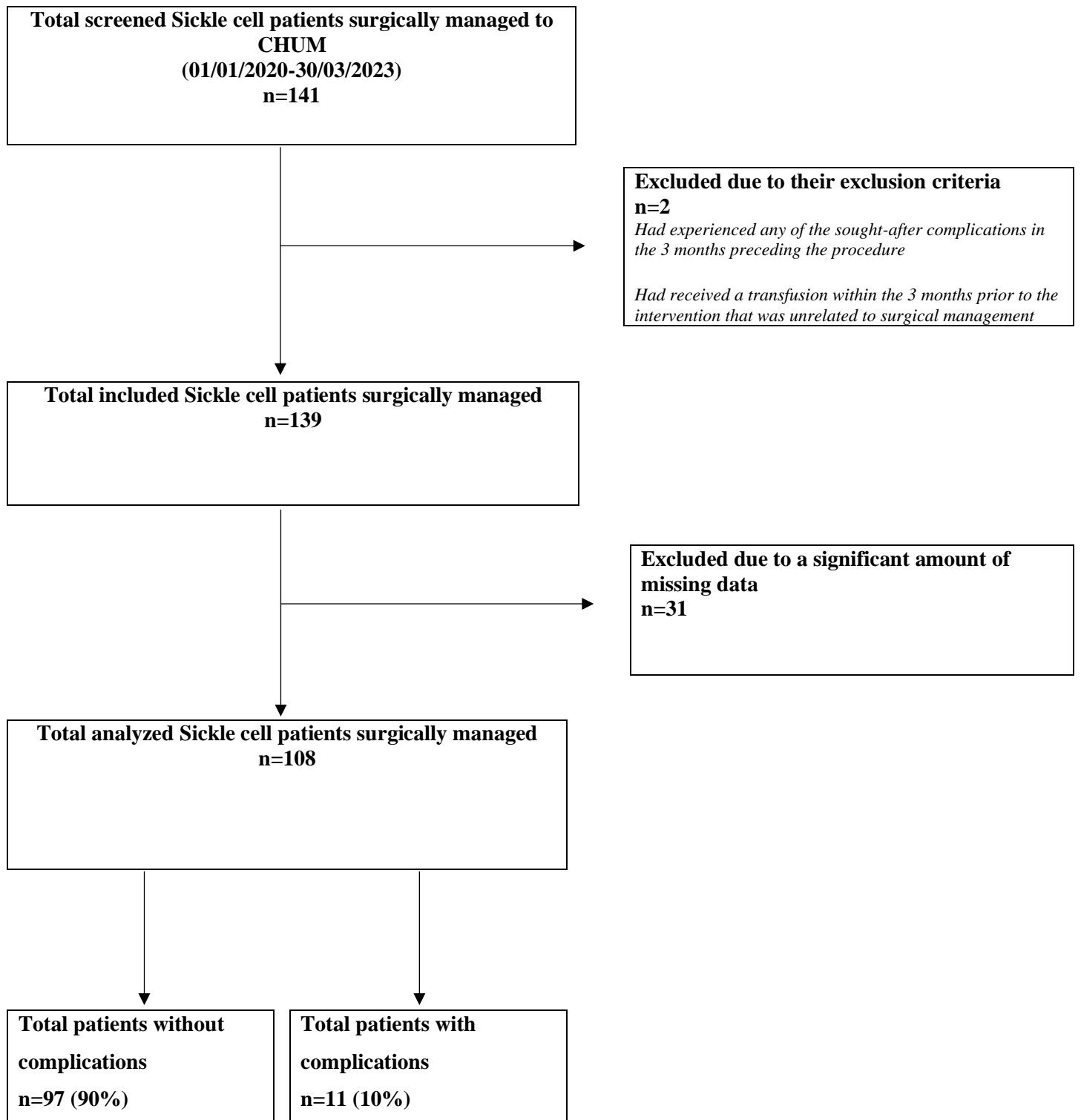


Table 1. BASIC CHARACTERISTICS of SCD patients

Characteristics	Overall	Complicated	Uncomplicated
	(n=108)	(n=11)	(n=97)
Demographics characteristics			
Age	25 (10-52)	38 (25-53)	19 (10-54)
Female	45 (42)	5 (45)	40 (43)
Male	63 (58)	6 (55)	57 (57)
Weight	49 (25-64)	63 (54-69)	47 (23-62)
BMI	18 (16-22)	20 (18-23)	18 (15-20)
Height (m)	1,6 (1,29-1,70)	1,74 (1,67-1,77)	1,59 (1,28-1,68)
Genotype			
SS	60 (55,6)	7 (64)	53 (48,2)
SC	35 (32,4)	2 (18,0)	33 (30,4)
SB	13 (12,0)	1 (9,0)	12 (11,1)
SCD characteristics-antecedent			
High blood pressure	15 (14)	3 (27)	12 (13)
Diabetes	0 (0)	0 (0)	0 (0)
Heart disease	7 (7)	0 (0)	7 (7)
Chronic kidney disease	8 (7)	3 (27)	5 (5)
Splenectomy	8 (7)	0 (0)	8 (8)
Cholecystectomy	14 (13)	3 (27)	11 (13)
History of specific sickle cell complications in a lifetime*	100 (93)	9 (91)	91 (95)
Sickle cell specific complications* in the last 365 days	53 (50)	6 (55)	47 (50)
Biological and clinical variables			
Lactate	1,8 (0,8-2,2)	1,6 (1,6-1,6)	2,1 (0,6-2,3)
Baseline hemoglobin	9 (8-10)	8,3 (8,0-9,7)	9,0 (8,0-10,5)
Preoperative hemoglobin (g/dL)	10,1 (8,7-11,1)	8,5 (7,2-9,9)	10,2 (8,8-11,4)
Preoperative hematocrit	29 (24-32)	26 (20,5-29,0)	29 (24,7-32)
Rate Hb F	4,4 (1,5-10,2)	5,5 (2,3-17,2)	4,2 (1,5-9,8)
Rate Hb S	44,4 (33,5-50,0)	72,5 (53,2-83,8)	43 (31,5-48,0)
Rate Hb C	44 (30-45)	39 (37-41)	44 (29,5-45)
White blood cells (G/L)	8,7 (6,9-10,9)	9,5 (7,6-11,9)	8,3 (6,8-10,6)
Platelets (G/L)	263 (183-380)	269 (223-320)	262 (183-389)
CRP (mg/L)	6 (1,2-20)	13 (10,7-117)	4,1 (1,0-17,2)
D-dimer	20 (11,4-115,0)	20 (20-20)	106 (54,6-158)
Fibrinogen (mg/L)	2,9 (2,4-3,6)	4,18 (3,16-4,20)	2,83 (2,41-3,39)
ASAT	38 (26-58)	29 (21-55)	39 (27-58)
ALAT	20 (13-40)	17 (10-35)	20 (14-41)
Prothrombin time (%)	82 (76-88)	89 (84-100)	82 (75-86)
Bilirubin T (umol/L)	27 (19-48)	24 (20-38)	28 (19-48)
LDH (UI/L)	391 (297-450)	316 (210-127)	399 (298-450)
Creatinine	48 (32-70)	64 (38-127)	48 (32-70)
Urea	3,0 (2,3-3,9)	2,3 (1,3-3,9)	3,1 (2,4-3,9)

Data expressed as median (25–75 % IQR) or proportion (%)

* vaso-occlusive crisis, acute chest syndrome, myocardial infarction, stroke, femoral osteonecrosis

Table 2. PERIOPERATIVE MANAGEMENT of SCD patients

	Overall	Complicated	Uncomplicated
	(n=108)	(n=11)	(n=97)
Preoperative / Intraoperative			
Preoperative blood transfusion (blood transfusion or exsanguino-transfusion)	35 (33)	5 (45)	30 (31)
Respiratory rate	17 (13-22)	23 (20-25)	17 (13-22)
Heart rate	79 (65-89)	73 (60-105)	79 (66-89)
Peripheral oxygen saturation	99 (98-100)	99 (96-100)	99 (98-100)
Temperature (°C)	36,3 (36,0-36,6)	36,2 (36-36,5)	36,4 (36,0-36,5)
Bleeding (ml)	0,0 (0,0-100)	50 (0,0-400)	0,0 (0,0-100)
Systolic blood pressure	112 (100-123)	120 (112-145)	111 (59-120)
Diastolic blood pressure	65 (58-74)	78 (57-88)	65 (59-71)
Intraoperative vasopressor use	15 (14)	2 (18)	13 (14)
Type of anesthesia			
General anesthesia	65 (60,2)	5 (38,5)	60 (55,6)
Regional anesthesia	16 (14,8)	3 (23,1)	13 (12,0)
General AND Regional anesthesia combined	27 (25)	4 (30,8)	23 (21,3)
Type of surgery			
Abdominal surgery	52 (48,1)	6 (5,6)	46 (42,6)
ENT (ear, nose throat) surgery	12 (11,1)	0 (0)	12 (11,1)
Orthopedic and spinal surgery	17 (15,7)	0 (0)	17 (15,7)
Ophtalmologic surgery	4 (3,7)	0 (0)	4 (3,7)
Gynecologic and plastic surgery	5 (4,6)	0 (0)	5 (4,6)
Obstetric surgery	5 (4,6)	3 (2,8)	2 (1,8)
Neurosurgical and neurovascular surgery	4 (3,7)	2 (1,8)	2 (1,8)
Simple general anesthesia	9 (8,3)	0 (0)	9 (8,3)
Surgical approach			
Emergency surgery	15 (13,9)	4 (30,8)	11 (10,2)
Elective surgery	93 (86,1)	7 (53,8)	86 (79,6)
Ambulatory surgery	16 (15)	0 (0)	16 (17)
Postoperative management			
Postoperative admission to a regular ward (no intensive care)	63 (59)	4 (36)	60 (63)
Pain in the recovery room / postoperative pain	22 (21)	3 (27)	19 (20)

Data expressed as median (25–75 % IQR) or proportion (%)

Table 3. OUTCOMES of SCD patients

	Overall	Complicated	Uncomplicated
	(n=108)	(n=11)	(n=97)
Postoperative complication within 30 days	11 (10)		
Pulmonary embolism	0 (0)		
Deep vein thrombosis	0 (0)		
Hospital-acquired postoperative infection**	3 (3)	3 (27)	
Surgical revision	1 (1)	1 (9)	
Vaso-occlusive crisis (VOC)	7 (7)	7 (64)	
Acute chest syndrome (ACT)	2 (2)	2 (18)	
Myocardial infarction	0 (0)		
Stroke	0 (0)		
Death	1 (1)	1 (9)	

Data expressed as median (25–75 % IQR) or proportion (%)

** Sepsis, Septic shock

Appendix

Table 1 bis. Definition of Acute chest syndrome (ACT)

The diagnosis of ACS depends on both radiographic evidence and clinical symptoms. To be diagnosed with ACS, a patient must meet the following criteria. (38,39)

- New pulmonary infiltrates on chest imaging (chest x-ray, CT) involving at least one lung segment; this cannot be due to atelectasis and must have one of the following symptoms :
 1. Chest pain
 2. Temperature more than 38.5°C
 3. Tachypnea, wheezing, rales, coughing, appearance of an increased work of breathing
 4. Hypoxemia, relative to baseline (more than 2% decrease in SpO2 from steady state on room air, PaO2 less than 60 mmHg)

Table 2 bis. Definition of « Pain » in the Post-Anesthesia Care Unit or Upon Admission to the service

In this study, we arbitrarily chose the pain variable in the PACU or upon service admission to be :

- the onset of pain in the recovery room that is difficult to manage with multimodal analgesia, requiring morphine titration beyond 8 mg
- or a patient not relieved before leaving the recovery room, i.e., with a VAS (Visual Analog Scale) score greater than 3
- or a patient experiencing pain recurrence in the ward with a VAS score greater than 3, not alleviated by conventional drug therapies prescribed by the doctor within the first 24 hours.

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UFR SCIENCES MEDICALES HYACINTHE BASTARAUD

SERMENT D'HIPPOCRATE

Au moment d'être admis à exercer la médecine, en présence des maîtres de cette école et de mes condisciples, je promets et je jure d'être fidèle aux lois de l'honneur et de la probité qui la régissent.

Mon premier souci sera, de rétablir, de préserver ou de promouvoir la santé dans tous les éléments physiques et mentaux, individuels, collectifs et sociaux. Je respecterai toutes les personnes, leur autonomie et leur volonté, sans aucune discrimination selon leur état ou leurs convictions.

J'interviendrai pour les protéger si elles sont affaiblies, vulnérables ou menacées dans leur intégrité ou dignité.

Même sous la contrainte, je ne ferai usage de mes connaissances contre les lois de l'humanité.

J'informerai les patients de décisions envisagées, de leurs raisons et de leurs conséquences.

Je ne tromperai jamais leur confiance et n'exploiterai pas le pouvoir hérité des circonstances pour forcer leurs consciences.

Je donnerai mes soins à l'indigent et à quiconque me les demandera.

Je ne me laisserai influencer ni par la recherche du gain ni par la recherche de la gloire.

Admis dans l'intimité des personnes, je tairai les secrets qui me sont confiés. Reçu à l'intérieur des maisons, je respecterai les secrets des foyers.

Et ma conduite ne servira pas à corrompre les mœurs.

Je ferai tout pour soulager les souffrances, sans acharnement. Je ne provoquerai jamais la mort délibérément.

Je préserverai l'indépendance nécessaire à l'accomplissement de ma mission. Que je sois modéré en tout, mais insatiable de mon amour de la science.

Je n'entreprendrai rien qui ne dépasse mes compétences ; je les entretiendrai et les perfectionnerai pour assurer au mieux les services qui me seront demandés.

J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité.

Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses, Que je sois déshonoré et méprisé si j'y manque.

**UNIVERSITÉ DES ANTILLES
FACULTÉ DE MÉDECINE HYACINTHE BASTARAUD**

DEMANDE D'IMPRIMATUR

**THESE POUR OBTENIR LE GRADE DE DOCTEUR EN MEDECINE
(SPECIALITE - MEDECINE SPECIALISEE)**

Facteurs de risques périopératoires de complications du sujet drépanocytaire

Nom et prénom : JOACHIM Prann

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RESUME :

Rationnel de l'étude :

La drépanocytose est une maladie génétique héréditaire caractérisée par des anomalies de l'hémoglobine. C'est la maladie génétique la plus fréquente dans le monde ainsi qu'en France, avec une prévalence plus élevée dans les régions d'Afrique subsaharienne, du Moyen-Orient, de l'Inde et des Caraïbes. La drépanocytose, malgré les avancées médicales, reste associée à une morbi-mortalité significative, notamment en période périopératoire.

Objectif :

L'objectif de cette étude est d'améliorer la prise en charge anesthésique et chirurgicale des patients drépanocytaires en identifiant plus précisément les facteurs de risques de complications péri-opératoires en Martinique.

Patients et Méthodes :

De janvier 2020 à mars 2023, nous avons réalisé une étude rétrospective au Centre Hospitalier de Mangot Vulcin en Martinique, dans un service spécialisé en drépanologie. Tous les patients drépanocytaires (SS, SC, S β) nécessitant une intervention chirurgicale, quel que soit leur âge ou leurs comorbidités, ont été inclus dans l'étude. Le critère de jugement principal de l'étude est la survenue de complications postopératoires dans les 30 jours suivant la chirurgie. Nous avons ensuite recherché, parmi les caractéristiques des patients, les variables significativement associées à la survenue de ces complications.

Résultats :

Après le screening initial, nous avons identifié 141 patients drépanocytaires potentiels. Parmi ceux-ci, 2 patients présentaient des facteurs d'exclusion et ont été par conséquent exclus de l'étude. Suite à des données manquantes, 31 autres patients ont également été exclus. En fin de compte, 108 patients drépanocytaires en période périopératoire ont été inclus dans l'étude. Après analyse des résultats, aucun facteur de risque de complication périopératoire n'a été retrouvé de manière significative.

Conclusion :

Cette étude n'a pas identifié de facteurs de risque de complications périopératoires significatifs chez les patients drépanocytaires en Martinique. Cependant, elle suggère une prise en charge périopératoire efficace en Martinique, avec peu de complications. Des recherches ultérieures et des études prospectives sont nécessaires pour approfondir ces constatations et guider les protocoles cliniques futurs.

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Jury : RESIERE Dabord

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