Editorial note: Certain information has been redacted from this judgment in compliance with the law.

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IN THE HIGH COURT OF SOUTH AFRICA

(EASTERN CAPE DIVISION, EAST LONDON CIRCUIT COURT)

CASE NO: EL314/2015

ECD NO: 714/2015

(1) REPORTABLE: NO/YES

(2) OF INTEREST TO OTHER JUDGES: NO/YES

(3) REVISED NO/YES

 **05/05/2023 ………………………...**

 DATE SIGNATURE

In the matter between:

**ZM obo SM** Plaintiff

and

**MEMBER OF THE EXECUTIVE COUNCIL**

**DEPARTMENT OF HEALTH, EASTERN CAPE** Defendant

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**J U D G M E N T**

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**DREYER AJ:**

In this matter I make the following order:

1. The plaintiff’s claim is dismissed.

2. No order as to costs

**INTRODUCTION**

[1] The plaintiff, ZM, gave birth to her daughter, SM […] September […], by caesarean section, after a protracted and difficult labour, in the Frere Hospital, East London. SM suffered a hypoxic ischaemic injury (HIE) of the brain prior to birth, resulting in neonatal encephalopathy (NE) and cerebral palsy (CP) (“the injury”)[[1]](#footnote-2). As a result of the injury, SM is a quadriplegic. SM never learned to walk, is unable to attend to her basic hygiene needs, is unable to dress herself has a pronounced slur, making it difficult for her to be understood.

[2] ZM seeks to claim damages against the defendant, the MEC for the Department of Health, Eastern Cape (“MEC”) both in her personal capacity and in her capacity as well as the mother and natural guardian of SM, for the injury SM suffered as a result of the alleged negligence of the Frere Hospital’s medical and/or nursing staff (“the defendant employees”) during ZM’s labour and delivery of SM.

[3] ZM’s claim is one in delict. As in all delicts, ZM as the party alleging injury must prove three elements. Firstly, that there was an injury. SM’s injury is not in dispute. Secondly, that the defendant’s employees were negligent in the care of ZM and by extension SM. Thirdly that SM’s injury was caused by the negligence of the defendant’s employees. The latter two elements are questions I am called to determine.

[4] ZM alleges that the defendant’s employees were negligent in the failing to:

4.1 property assess and examine the plaintiff on her admission;

4.2 note or appreciate that the plaintiff had developed complications;

4.3 monitor the plaintiff’s labour and foetal well-being appropriately and with sufficient regularity;

4.4 monitor the plaintiff labour appropriately, timeously, with the sufficient frequency;

4.5 arrange timeously for the transfer of the plaintiff to an appropriate facility for the performance of the caesarean section;

4.6 inform the plaintiff of the reasonable or expected risk associated with an unduly prolonged period of labour or failure to timeously perform a caesarean section;

4.7 prevent SM from suffering cerebral damage at birth.

[5] In the course of the trial, ZM’s representatives, only canvassed the grounds of negligence set out in 4.3, 4.4, and 4.7 above. ZM contention is that SM’s injury and the resultant cerebral condition is due to the substandard and negligent treatment ZM received at the hands the defendant’s employees, during ZM’s labour and birth of SM, which was preventable.

[6] The MEC denied her employees were negligent or provided substandard care to ZM. The MEC pleaded that her employees did all they could to prevent SM from suffering cerebral damage. In addition, the MEC pleaded that should such negligence be proven; this negligence did not cause SM’s cerebral condition.

[7] At the commencement of the trial, the parties requested a separation of the merits and quantum. I granted such order, by agreement, in terms of uniform rule of court 33 (4). The trial proceeded solely on the merits, more specifically the determination of the questions of negligence and causation.

**LACK OF MEDICAL RECORDS**

[8] The only medical records tendered in evidence at trial were SM’s “Road to Health Chart” and her hospital records from various units of the Frere Hospital, including the paediatric neurodevelopment clinic. The Road to Health Chart, is not itself a medical record. It is merely a recordal of a child’s health immunisations and health interventions at a primary health care facility. As such it is secondary evidence.

[9] No antenatal nor neonatal nor maternity records were tendered in evidence. These records record the medical attention provided and/or medication given to the mother in the instance of the antenatal and maternal records and the new-born infant in the instance of the neonatal record. The records are critical evidence of the standard and extent of care that the defendant employees provided to both ZM and SM. Absent these medical records, there is no objective recordal of the actual care that either ZM or SM received from the defendant’s employees. There was no explanation from either party as to the absence of these medical records. The parties accepted that SM’s Road to Health Chart and her hospital records from the age of 6 months, were the only available medical records. Though I specifically requested the parties to address me on the absence of medical records in argument, regrettably, the plaintiff’s representative did not do so.

[10] The defendant representative argued that, given the lapse of time between the birth of SM in 1996 and the institution of the action in 2015 when SM was 18 years old, it is not surprising that the records were not available. In the absence of evidence by the defendant providing an explanation for the missing medical records, this line of argument by the defendant’s representative is mere speculation. The failure by the MEC to account to the court for the absence of medical records at a health facility under her control is unfortunate.[[2]](#footnote-3)

[11] The defendant’s representative argued that the absence of medical records is a neutral factor, as both parties were equally hampered by the unavailability of medical records. While this may be factually true, this is not the legal standard.

[12] The implications for missing medical records are articulated by Spilg J in *Khoza v The MEC for Health and Social Development, Gauteng*:[[3]](#footnote-4)

“*In summary, the failure to produce the original medical records which are under a hospital’s control and where there is no acceptable explanation for its disappearance or alleged destruction –*

*a.  may result in the inadmissibility of ‘secondary’ evidence if the interests of justice so dictate, whether such evidence is of a witness who claims to have recalled the contents of the lost document or to have made a note of its contents on another document;*

*b.  cannot of its own be used to support an argument that a plaintiff is unable to discharge the burden of proof because no one now knows whether the original records would exonerate the defendant’s staff from a claim of negligence;*

*c.  may result in the application of the doctrine of res ipsa loquitur in an appropriate case;*

*d.  may result in an adverse inference being drawn that the missing records support the plaintiff’s case in matters where the defendant produces other contemporaneous documents that have been altered, contain manufactured data or are otherwise questionable, irrespective of whether the evidence of a secondary witness called in support is found to be unreliable or untruthful.*”

[13] These observations by the court in the Khoza decision are apposite to this matter, particularly as no medical records exist. Both parties accepted the secondary evidence recorded in the Road to Health Chart.[[4]](#footnote-5)

[14] Pillay J, in *Madida obo M v The MEC for Health, Province of KwaZulu-Natal*,[[5]](#footnote-6) takes the implications for missing medical records further is by addressing the absence of medical records in light of the obligations of employees of a MEC for Health in terms of the National Health Act[[6]](#footnote-7) and the Health Professions Council’s Guidelines.

“*[10] In terms of sections 13 and 17 of the National* [*Health Act 61 of 2003*](http://www.saflii.org/za/legis/consol_act/nha2003147/)*, the defendant’s employees have a statutory duty to preserve and protect such hospital and medical records. Failure to do so opens the defendant’s employees to criminal prosecution and liable on conviction to a fine or to imprisonment for a period not exceeding one year or to both such fine and imprisonment.*

*[11] The Health Professions Council’s Guidelines on the keeping of patient records dated May 2008 applies to health care practitioners in both the private and public service. It identifies what constitutes health records, why documents or materials should be retained and what information is compulsory for recording. It prohibits alteration of records and requires reasons for any amendments to be specified on the record. Errors may be corrected but the date of the change must be entered, and the correction signed in full. The original record must remain intact and fully legible. Additional entries at a later date must be dated and signed in full. The guidelines also provide for the retention of health records, which must be stored in a safe place and if stored electronically then safeguarded by passwords. In the case of minors, their records must be kept until the minor’s twenty-first birthday. For mentally incompetent patients the records must be kept for the duration of the patient’s life. Health records kept in a provincial hospital or clinic including the records of minors and mentally incompetent patients may only be destroyed with the authority of the Deputy Director General concerned.*

*[12]    I have detailed the National Health Act and Guidelines to emphasise their importance and the rationale and seriousness with which the health professions view the keeping of patients’ records. So, when they are not available when they should be there is potentially a breach of the rule of law and codes of good practice. Non-compliance with statutory requirements and codes of good practice that impact directly on the health of members of the public is cause on its own to refuse the adjournment. To do otherwise would lead to the mistaken inference that the court is prepared to condone or tolerate the illegality. The lack of a bona fide explanation for the unavailability of the records fortifies my opinion.*”

[15] While National Health Act was not enacted in 1996, and the pre-emptory provisions relating to record keeping were not application at the time of ZM’s labour and SM’s birth, there has always been a duty on medical professionals, including the employees of the MEC, to ensure that medical records are retained.

[16] Medical professionals are required to register with the Health Professions Council (HPCSA)[[7]](#footnote-8). The HPCSA Professional Ethical, Guidelines record the obligation to retain medical records thus:

*“Health records should be stored in a safe place and if they are in electronic format, safeguarded by passwords.  Practitioners should satisfy themselves that they understand the HPSA’s guidelines with regard to the retention of patient records on computer compact discs.  Health records should be stored for a period of not less than six (6) years as from the date they became dormant.  In the case of minors and those patients who are mentally incompetent, health care practitioners should keep the records for a longer period.  For minors under the age of 18 years health records should be kept until the minor’s 21st birthday because legally minors have up to three years after they reach the age of 18 years to bring a claim.  This would apply equally for obstetric records …*

*Notwithstanding the provisions … above, the health records kept in a provincial hospital or clinic shall only be destroyed if such destruction is authorised by the Deputy Director-General concerned …*”[[8]](#footnote-9)

[17] These guidelines emphasise the importance of the retention of medical records, in particular as far as these relate to children. Of critical importance in this matter, is that provincial hospital, such as the Frere Hospital, may only destroy medical records if so authorised by the deputy director general. No such evidence was led, that any person had authorised the destruction of the missing medical records.

[18] The absence of medical records was a factor raised by all the experts, as limiting their ability to give definitive opinion on the cause and timing of SM’s injury.

[19] Despite the absence of medical records under her control, the defendant pleaded a bare denial that her employees were negligent. Pleading to each aspect of negligence as pleaded by the plaintiff, that the defendant *“categorically denied negligence and put the plaintiff to the proof*”.

[20] Pillay J, in *Madida*, considered such pleading as *“to plead ‘no knowledge’ and to put to the plaintiff to the proof of facts that should be easily ascertainable was not a plea in good faith. It is hardly the response of a caring health service. Proof as to whether a medical doctor had attended to the plaintiff had to come from the hospital staff on duty at the time and from their records*”.[[9]](#footnote-10)

[21] The observations of the court in Madida are equally applicable to the facts in this matter. There was no explanation by the defendant for the lack of ZM’s medical records, despite the obligations of the MEC’s employees to retain such records.

[22] The only medical record available of evidentiary value in the determination of SM’s injury was the Road to Health Chart. This was the sole medical record referred to by the parties in evidence. The information as recorded on the Road to Health Chart is accepted by both parties *inter alia*.

22.1.1. the name of SM, her date and place of birth (29 September 1996 at the Frere Hospital), SM’s birth length (52cm) and her birth head circumference (36cm). These measurements were taken on 9 October 1996;

22.1.2. under the heading *“problems during pregnancy, birth or neonatally*” is recorded, caesarean section, severe HIE, nursed on a ventilator x 2 days, the Apgar scores at one minute- 2/10 and at ten minutes - 3/10;

**WITNESSES**

[23] ZM was the only factual witnesses who testified. No factual witness testified for the defendant.

[24] Both the plaintiff and defendant called an Obstetrician and Gynaecologist (Dr Nyjapa for the plaintiff and Dr Wright for the defendant) and a Paediatrician (Dr Maponya for the Plaintiff and Dr Ramsurpdam; a Neuro Developmental Paediatrician).

[25] The parties agreed to contents of the joint minutes of the Radiologists (Dr Zulu for the plaintiff and Andronikou for the defendant) in relation to the magnetic resonance imaging (MRI) brain scan SM underwent on 21 October 2015. The joint minute was accepted into evidence without either of the radiologists testifying.

**COMMON CAUSE FACTS**

[26] The common cause facts as recorded in the pretrial minutes were the facts recorded in the Road to Health Chart set out above and[[10]](#footnote-11):

26.1 the plaintiff is acting in her personal and representative capacity as the mother and natural guardian of SM, born on 29 September 1996, at the Frere Hospital, East London;

26.2 the plaintiff was admitted to the Frere Hospital on 29 September 1996 for the birth of SM;

26.3 SM was delivered by caesarean section at approximately 16h00, with a diagnosis of foetal distress;

26.4 at birth, SM was floppy, did not cry and asphyxiated with low Apgar scores, requiring oxygen therapy management in ICU;

26.5 SM was born with a large foetal head size, which might be indicative of cephalopelvic disproportion;

26.6 SM suffers from dyskinetic quadriplegic cerebral palsy or athetoid cerebral palsy;

26.7 MRI study, as agreed to by the Radiologists,

26.7.1. displays hypoxic ischaemic injury of the brain with central basal ganglia thalamic pattern, which likely occurred in the peri- and/ intrapartum[[11]](#footnote-12), period of a brain of term maturity;

26.7.2. suggests that it unlikely that genetic disorder or congenital malformation are a cause of the child’s brain damage.

27.8. The cause of SM’s neonatal encephalopathy is a severe hypoxic encephalopathy according to the Road to Health Chart.

[27] Despite the agreement between the parties that SM was “floppy at birth and did not cry” the defendant’s experts disputed this, as there were no medical records to support this fact. I will return to this later.

**PLAINTIFF’S EVIDENCE**

[28] ZM testified that she went into labour in the early hours of 26 September 1996. She woke at 03h00 in the morning and noticed that she had blood spotting and mucus in her underwear. This was ZM’s second pregnancy. ZM woke her husband and told him she was in labour. ZM’s husband left their home to find to transport to convey ZM from their home in Idutywa to the Frere Hospital in East London. The transport ZM’s husband secured, left Idutywa at approximately 07h00. ZM arrived at the Frere Hospital at approximately 09h00 and was admitted.

[29] ZM was examined vaginally on her admission. The attending nursing sisters told her that she was “far” from giving birth. She was told to walk in the ward’s passages to accelerate the labour. After an about hour, she was again examined vaginally by the attending nurse, who, once more, told her that her labour had not progressed. This nurse called another nurse, a male nurse and told him that ZM was not dilating. The first nurse asked the second, the male nurse, to call a third nurse to come to examine ZM and find out why ZM was not dilating and had not yet given birth. The third nurse arrived and examined ZM, once more vaginally.

[30] ZM testified that that this third nurse told her she was going to administer a gel vaginally to accelerate ZM’s labour. ZM testified that after administration of the gel her labour contractions intensified; the contractions were severe and painful. ZM continued to walk the corridors of the ward, as the nurses instructed until the contractions became too severe for her to continue.

[31] After about another hour ZM testified she was again examined vaginally, for the fourth time The nurses told her she was still not dilating enough to give birth. The nurses administered a second dose of the gel. The labour contractions increased and were even more painful.

[32] ZM testified that approximately an hour after the second application of the gel, the nurses once more examined her vaginally. This was her fifth vaginal examination. The nurses told ZM that she was still “far” from giving birth. ZM testified that the nurses administered a third dose of the gel vaginally, to accelerate her dilation.

[33] ZM testified that the nursing staff only examined her vaginally and did not monitor the foetus in the same manner that the foetus was monitored when she had attended at the Idutywa clinic for her prenatal check-ups. There, ZM testified, an instrument had been used to listen to the foetus’s heart rate. The nurse placed the instrument on her ear and the other side of the instrument against ZM’s stomach to hear the foetus’s heart rate. This was the only way ZM knew that a foetus was examined. ZM testified that no instrument was used to monitor her or the foetus while she was in labour from the time she was admitted at the Frere Hospital.

[34] ZM testified that at about 13h00, soon after the third occasion gel was administered, another nurse came into the ward, as the attending nurse took a lunch break. ZM overhead the nurses speaking to one another and discussing her condition namely that her labour had not progressed despite the application of the gel.

[35] In the absence of available hospital records, there is no evidence as to what “gel” was administered to ZM, the dosage of such gel in each of the three applications or the specific time lapse between administration of each dosage.

[36] ZM ’s evidence was that she continued to have labour pains throughout the day which increased in intensity.

[37] After the third dose of the gel, ZM testified the contractions were too painful for her to continue walking and she lay down. ZM testified that she became confused, drowsy and dizzy. She felt powerless. ZM testified she must have fallen asleep. She had no clear recollection of what happened after the receiving the third dose of the gel. ZM conceded in cross examination that she does not know or cannot recall if she was examined again that afternoon or if the foetus was examined.

[38] Sometime later in the afternoon, ZM testified, she became aware of two medical doctors and a nurse standing over her. One of the doctors told ZM that not only was she in trouble but that the baby was in trouble. This medical doctors assisted her to sign a consent form for her to undergo a caesarean section.

[39] It was this doctor’s voice asking her the sign the consent form that woke her. ZM says she woke to the words “*Mama sign here*”. ZM had no recollection if these doctors examined her or the foetus before asking her to sign the form.

[40] ZM was taken into theatre immediately. Another doctor explained to her that she would be injected into her back so that she would have no feeling in her lower body, only her upper body. ZM was given an epidural injection.

[41] ZM testified she was then operated on; SM was “taken out”. ZM was not given SM to hold. ZM did not see SM. ZM did not hear SM cry. The medical staff took SM to examine. ZM overheard the medical staff saying the word “*floppy*”. SM was taken away.

[42] On the 30 September 1996, ZM saw the male nurse who had examined her during labour, the day before. She asked him where her baby was as she had not yet seen her. The male nurse told her SM was in intensive care (“ICU”) and ZM could see SM the next day.

[43] ZM saw SM for the first time three days after her birth. SM was in an incubator on oxygen and has been fed intravenously. There was foam on SM’s mouth, there were tubes inserted into her nose, one hand was swollen from the feeding drips inserted into it. SM remained in ICU for one week, fed intravenously.

[44] SM was unable to suckle when she was discharged from ICU and had to be taught to latch to ZM’s breast. ZM remained at the Frere Hospital for another two weeks. All this time SM never cried.

[45] ZM was told on her and SM’s charge from the Frere Hospital to bring SM back after 6 months for a check-up. At this consultation ZM was told that SM had cerebral palsy and would never walk.

[46] ZM testified that having a physically challenged child is painful and exhausting as she has to constantly care for SM. This has been ZM life ever since SM’s birth.

[47] These facts are not in dispute.

**EXPERT EVIDENCE**

[48] The joint minute of the radiologists, Dr Zulu for the plaintiff and Dr Andronikou for the defendant, was accepted by the parties. The joint minute recorded agreed interpretation of MRI scan taken on 21 October 2015.

48.1 The MR study displayed [hypoxic ischaemic](https://www.google.com/search?sxsrf=APwXEdflucOSoAgQO_7lX0tVxv_r4twuRA:1681311931142&q=hypoxic+ischaemic&spell=1&sa=X&ved=2ahUKEwjd66WDz6T-AhUOS0EAHSNRDEoQkeECKAB6BAgHEAE) injury of the brain with a central basal ganglia thalamic pattern which most likely occurred in the peri/intrapartum period in the brain of term maturity.

48.2 That the brain injury is in its chronic stage of evolution.

48.3 Infective disease is unlikely to be the cause for the combined findings demonstrated on the various MRI sequences.

48.4 Genetic disorder and/or congenital malformation as the cause of the child’s brain damage is unlikely.

[49] A central basal ganglia thalamic pattern of injury is especially associated with motor impairment, while the watershed pattern of injury, seen after more prolonged and/or repetitive antenatal events, is more often associated with cognitive problems.[[12]](#footnote-13) CP is a motor impairment disorder.

[50] While the radiologists agreed to the extent and cause of the injury, neither in their individual reports made a determination of the timing of the injury. This they opined it was a matter for the appropriate specialist in the fields of neonatology, neurology, and obstetrics to consider with reference to the neonatal and obstetrical records determine the underlying clinical factors and the probable timing of the brain injury.

[51] When the injury occurred in the inter-partum period (that is from the onset of labour until the placenta is pushed out) is relevant for consideration of the questions of both negligence and causation.

**Evidence of the Obstetricians**

[52] In their joint minute of Dr Ndjapa Ndamkou and Dr Wright agree that, as SM was delivered by caesarean section with a diagnosis of foetal distress, there was an element of foetal monitoring present.

[53] SM’s large foetal head size was indicative of cephalopelvic disproportion. While this was canvassed in evidence, neither expert ascribed this as a cause SM’s injury.

[54] SM was asphyxiated at birth with a low Apgar score and required management in ICU. The injury occurred in the intra partem period of labour, causing SM’s asphyxia.

[55] In the absence of neonatal and obstetrical medical records, the experts of the respective parties took diametrically opposing positions as to when the injury occurred.

[56] Dr Ndjapa interpreted the joint minute of the radiologist that it was indicative of a slow deprivation of oxygen to the foetus’ brain, over an extended period of time.

[57] Dr Ndjapa’s position was supported by Dr Maponya, opined that an injury of the central or basal ganglia was evidence of prolonged damage to the basic functionality of the foetus, in particular, a lack of oxygen and blood. This was indicative of a shunting down of all but the most critical bodily functions or organs.

[58] In comparison, Dr Wright, was of the view that the damage to the central basal ganglia indicated an acute or sentinel event. The nature of a sentinel event was such that the speed at which the emergency arises, nothing can be done to prevent the injury.

[59] The conclusions reached by Dr Ndjapa and Dr Wright, as to the timing of the injury, was not contested by either party’s representatives in cross examination.

[60] Dr Ndjapa testified that the application of a gel to induce labour should be accompanied by constant monitoring of both the mother and the foetus, as inducing labour increases the risk in labour. Severe uterine contractions could lead to reduced blood in the placenta and consequently the foetus. Another factor was the disproportion between sizes of the mother’s pelvis and foetus’ head. This could compromise oxygen to the brain of the foetus. Constant monitoring would have allowed the defendant’s employees to determine the foetal stress timeously.

[61] Consequently, Dr Ndjapa opined that there was inadequate and inappropriate monitoring of ZM labour during the intrapartum period.

[62] That said, Dr Ndjapa conceded under cross examination that in the absence of the medical records, not knowing how long the foetal distress continued, he could not exclude the possibility of a sentinel event, but that in his opinion it was an unlikely possibility.

[63] Dr Wright’s opinion was in light of the apparent sentinel event indicative in the MRI scan, and the fact that ZM was taken into theatre for an emergency caesarean immediately after being examined by two doctors, ZM received adequate and appropriate care during her labour. Dr Wright testified that when a woman is examined during labour, so too is the foetus. The *“two go hand in glove”.*

**Evidence of the Paediatricians**

[64] Dr Maponya and Dr Ramsundhar disagreed regarding the cause of SM’s injury. Dr Maponya’s accepted the recordal on the road to health chart of *sever hypoxic encephalopathy*. Despite this being a fact as agreed to by the parties, Dr Ramsundhar speculated that neonatal jaundice and neonatal sepsis could create a similar clinical picture. The defendant led no factual evidence to support Dr Ramsundhar ’s proposition. I consequently reject this proposition as mere speculation.

[65] Dr Maponya and Ramsundhar applied Volpe’s criteria to ascertain whether the intrapartum asphyxia had occurred. They agreed that three of the four criteria were met, mainly, foetal distress, resuscitation at birth and respiratory affectation requiring ventilation for two days. Both agreed that the presence of a neurological syndrome during the first few hours of SM’s life, the last of Volpe’s criteria is unknown, in the absence of medical records.

[66] By application of the American College of Obstetrician and Gynaecological Criteria to confirm the intrapartum asphyxia, the Dr Maponya and Ramsundhar agreed that.

66.1 Apgar scores were less than five immediately after birth.

66.2. MRI scan shows hypoxic ischaemic injury which likely happened in the peri or intrapartum period in the brain of term maturity.

66.3. There was a respiratory organ failure.

66.4. There were no blood gas results of the foetal umbilical acidaemia available.

[67] Blood gas results are an objective measure of foetal metabolic condition at the time of delivery. The determination of the foetal acid base status helps identify infants at risk for neonatal encephalopathy. It is also indicative of foetal hypoxic stress[[13]](#footnote-14)

[68] The Paediatricians agreed that the question whether there was a sentinel (acute) event associated with the labour was a matter for the determination of the obstetricians.

[69] Consequently, the evidence of the paediatricians does not assist in the determination of the negligence of the defendant’s employees.

**WEIGHT OF EXPERT EVIDENCE**

[70] The fact agreed in a joint expert minute is a fact of which no evidence need be tendered at trial. The trial court can and must accept it as true.[[14]](#footnote-15) It is on this basis that the Radiologist joint minute was accepted into evidence. Trial Court is not entitled to have regard to evidence led at a trial contrary to an expert agreement.[[15]](#footnote-16)

[71] This approach was approved by the Supreme Court in the unanimous decision *MEC for Health and Social Development, Gauteng v MM obo OM.[[16]](#footnote-17)*

[72] Expert agreements are critical to frame the true issues for determination by the Trial Court and to provide a logical framework within the Court can come to a sound conclusion of facts on which it has no specialised knowledge.[[17]](#footnote-18)

[73] The role of the Court in evaluating the connection between facts and expert evidence is articulated in the decision of *MV Pasquale Dell Gatta*[[18]](#footnote-19) as follows:

“*The court must first consider whether the underlying facts relied on by the witness have been established on a prima facie basis. If not then the expert’s opinion is worthless because it is purely hypothetical, based on facts that cannot be demonstrated even on a prima facie basis. It can be disregarded. If the relevant facts are established on a prima facie basis then the court must consider whether the expert’s view is one that can reasonably be held on the basis of those facts. In other words, it examines the reasoning of the expert and determines whether it is logical in the light of those facts and any others that are undisputed or cannot be disputed. If it concludes that the opinion is one that can reasonably be held on the basis of the facts and the chain of reasoning of the expert the threshold will be satisfied. This is so even though that is not the only opinion that can reasonably be expressed on the basis of those facts. However, if the opinion is far-fetched and based on unproven hypotheses then the onus is not discharged.”*

[74] Expert evidence must be based on relevant facts disclosed by admissible evidence. The defendant led no factual witnesses and relied solely on the expert evidence of Drs Wright and Ramsundhar. Both specialist doctors were sceptical of the ZM’s version in the absence of collaborating and supporting medical documentary evidence. ZM’s evidence was not challenged in any material respect in cross examination.

[75] In the absence of factual evidence on which the defendant’s experts could base their opinions, I am constrained to accept the hypotheses of these experts, particularly given the failure of the MEC to account for the absence of ZM and SM’s medical records in her possession.[[19]](#footnote-20)

[76] Once the plaintiff has given an acceptable explanation for her claim, the evidentiary burden in a medical negligence matter shifts to the defendant. In *Meyers v MEC, Department of Health, Eastern Cape*,[[20]](#footnote-21) Ponan JA for the Court held that:

*“[It] was sufficient as to place an evidentiary burden upon [the doctor] to shed some light upon the circumstances attending [the plaintiff’s] injury. Failure to do so meant that, on the evidence as it then stood, he ran the risk of a finding of negligence against him. For, whilst [the plaintiff] bore the overall onus in the case, [the doctor] nonetheless had a duty to adduce evidence to combat the prima facie case made by [the plaintiff]. It remained for him to advance an explanatory (though not necessarily exculpatory) account that the injury must have been due to some unpreventable cause, even if the exact cause be unknown.”*

[77] The defendant led no evidence to disturb the prima facie case established by plaintiff. The opinion of the defendant’s expert witness has no weight without a foundation of facts.

**INTERPRETATION OF THE MRI SCAN**

[78] The radiologists agreed in the interpretation of the MRI scan, namely that the MR study displays a [hypoxic ischaemic](https://www.google.com/search?sxsrf=APwXEdflucOSoAgQO_7lX0tVxv_r4twuRA:1681311931142&q=hypoxic+ischaemic&spell=1&sa=X&ved=2ahUKEwjd66WDz6T-AhUOS0EAHSNRDEoQkeECKAB6BAgHEAE) injury of the brain with a central/basal ganglia thalamic pattern[[21]](#footnote-22) which most likely occurred in the peri/intrapartum period in the brain of term maturity.

[79] A basal ganglia thalamic pattern is a pattern of injury most often seen following an acute sentinel event such as a ruptured uterus, placental abruption, or a prolapsed cord. This Dr Zulu records this in his report.[[22]](#footnote-23) Dr Andronikus’ report records that the MRI features are indicative of a profound injury.[[23]](#footnote-24) The medical terms a “sentinel event” and “profound injury” appear to be used interchangeably in the medical literature.

[80] However, Dr Zulu’s report also records that the basal ganglia thalamic pattern has also been described (in literature) with infants who have had no sentinel event but a prolonged exposure to suboptimal oxygen levels or hypoxia.

[81] The distinction between a sentinel event and a prolonged exposure to suboptimal oxygen levels is discussed extensively by the Supreme Court in the decision of *AN obo EN v The MEC for Health Eastern Cape*.[[24]](#footnote-25)

[82] The court found that an acute profound event, resulted in an injury to the deep brain structure, that is the “*grey matter*” or the core of the brain. An acute profound event was a sudden event, causing a total and persistent lack of blood supply (so and oxygen) to the brain.[[25]](#footnote-26) This was to be compared to partial prolonged hypoxic – ischaemic event which caused injury to the “*white matter*”, the peripheral structure of the brain. Such an injury is caused by an inadequate supply of oxygen in the placenta. The brain shunts the blood to the deep grey matter of the brain (which controls the essential organs). Shunting causes damage to the white matter.[[26]](#footnote-27) The MRI scan shows that SM’s brain injury is to her *grey matter*, not her *white matter* .

[83] In AN obo EN the court records that the experts agreed that the only way to prevent injury where there is a sudden total interruption of blood supply, was an expedited delivery.[[27]](#footnote-28)

[84] In this matter the uncontested facts are that when the defendant’s employees identified foetal distress, ZM was taken into theatre immediately for an emergency caesarean section.

[85] In the decision of *AM obo KM v, The MEC for Health Eastern Cape*,[[28]](#footnote-29) the use of the words *“chronic evolution*” when qualifying an injury of *“the acute profound type*” meant that the acute profound hypoxic ischaemia was not a sentinel event but rather that the hypoxia and foetal distress developed undetected due to a lack of monitoring over some time.

[86] In this matter, neither of the radiologists used the terminology *“chronic evolution*”, nor was there any evidence of a development of hypoxia and foetal distress over a period of time. No evidence was led as to whether the injury was as a result of an acute event, meaning a sudden event, the consequences of which could or could not be avoided as opposed to a progressive prolonged event, the consequences of which could be prevented by adequate monitoring.

[87] Medical literature no longer draws a sharp distinction between the two MRI patterns. In the article “*Intrapartum Basal Ganglia-Thalamic Pattern Injury and Radiologically Termed "Acute Profound Hypoxic-Ischemic Brain Injury" Are Not Synonymous”[[29]](#footnote-30),*  The authors record that even where the duration of the HI injury is identified there is often uncertainty of the prior foetal health. Their study shows that “*if a non-reassuring foetal status develops during labour and is prolonged, a BGT pattern HI injury may result, in the absence of a perinatal sentinel event. Intrapartum BGT pattern injury and radiologically termed "acute profound HI brain injury" are not necessarily synonymous. A visualized magnetic resonance imaging (MRI) pattern should preferably solely reflect the patterns description and severity, rather than a causative mechanism of injury.*

[88] In this study undertaken by the authors, 60% of the sample were delivered by unassisted vaginal birth and 40% by delayed caesarean section.

[89] The facts in this matter differ from the study sample. There was no delay in ZM’s caesarean section. ZM was taken into theatre immediately, when the defendant’s medical staff determined that both ZM and the foetus were “*in trouble”*.

[90] Dr Alheit in a letter to the editor in the SA Journal of Radiology[[30]](#footnote-31) states the importance of the correct terminology in interpreting MRI scans of the brain is to disavow the belief recorded by the courts in innumerate decisions that “*very little could have 'ever' been done to arrest the process of foetal neurological injury where that injury is reported as 'acute profound' on MRI.*”

[91] The radiologists joint minute records that a review of the neonatal and obstetric records by gynaecologists and obstetricians is appropriate to determine the underlying clinical factors and the probable timing of the brain injury. In the absence of these medical records the obstetricians expressed their respective opinions.

[92] Drs Ndjapa and Wright were at odds as to the timing of the hypoxia. No evidence was led as to whether there was a sudden total persistent lack of a blood supply to the brain, which would be indicative of a sentinel or acute event or a reduced volume of blood indicative of a prolonged partial event. The first would be indicative that there was an emergency situation causing the injury, the second that the injury occurred over an extended period of time. The Road to Health Chart records no sentinel event.

[93] The critical factor I have to determine is not whether there was sudden event or a prolonged event resulting in the injury, but rather whether the monitoring and care provided to ZM by the defendant’s employees was the cause of SM’s injury. Put another way, whether the injury would not have happened had ZM been given adequate and appropriate care by the defendant’s employees.

[94] Both representatives for the respective parties examined and cross-examined the other’s witnesses extensively by enquiring whether there was *“sufficient*” or “*adequate*” monitoring and care of the plaintiff or whether the care was “*substandard”*. No facts were put to the witnesses or evidence elicited as to why the care was “*sufficient”* or “*adequate”* or not. Neither representatives elicited any evidence from the expert witnesses as to what was meant by “*adequate and/or sufficient*” monitoring and care in the circumstances of ZM’s labour.

[95] ZM’s evidence that she was examined five times vaginally is uncontroverted. The defendant led no evidence to gainsay ZM’s evidence that there was no monitoring of the foetus. It was accepted by all the experts that this is a basic minimum for all women in labour. Consequently, I find that the MEC employees were negligent.

[96] But did this negligence cause the injury.

[97] ZM’s evidence that she became dizzy and drowsy after the third application of the gel. While ZM had no recollection being examined at this time, she conceded under cross examination that this was possible. She testified that that had little recollection of the events after this until she was woken by one of two medical doctors requesting that she consent to a caesarean section, as both she and her baby “were *in trouble*”. This is indicative that MEC employees took action at a critical stage, when there were signs of both foetal distress and potential harm to ZM health. A decision to perform a caesarean section was taken and acted on immediately. Dr Ndjapa accepted that there was some foetal monitoring for the medical staff to make a decision to conduct a caesarean section. I accept Dr Ndjapa’s opinion.

[98] No evidence was elicited from Dr Ndjapa in regard to the timing of an appropriate intervention(s) to avoid the injury. Dr Ndjapa did not testify how much earlier in ZM’s labour a caesarean section should have been considered.

[99] The absence of medical records makes it impossible to determine, with any level of accuracy, whether there were contributing factors of ZM’s health which may have exacerbated any distress that SM was under *in utero.* For the same reason it difficult to establish precisely what type or level of care ZM received during her labour and what care was given to SM immediately after her birth

[100] While the Frere Hospital staff were negligent in failing to provide ZM with adequate care and monitoring during her labour, there is no evidence that SM’s injury was as a result of such negligence. The defendant’s employees acted with immediate haste and performed an emergency caesarean section when they determined the maternal and foetal distress. This was ZM’s own evidence.

[101] In the result I find that ZM has failed to prove the element of causation necessary to hold the defendant liable for SM injury.

**CONCLUSION**

[102] This brings me to the question of costs. I am disinclined to grant an order for the costs to follow the event as is the norm. SM suffered an extensive injury at or during her birth. SM is severally disabled, she is unable to feed herself, attend to her basic hygiene requirements or dress herself. She has never been able to fend for herself. ZM is her full- time carer. Consequently, ZM has not been able to hold down any form of employment since SM’s birth 26 years ago. In such circumstances I am not prepared to grant a costs order against the plaintiff in favour of the state.

[103] The plaintiff’s claim is dismissed, no order as to costs.

 **C J DREYER**

**ACTING JUDGE OF THE HIGH COURT**

**Representation for plaintiff**

Counsel: Adv Qitsi SC

 Adv Nabile

Instructed by: Njuze & Associates Inc, East London

**Representation for defendant**

Counsel: Adv Mtshabese SC

Instructed by: Office of State Attorney, East London

Matter heard on 22, 23, 24 August, 2 and 12 September 2022

Judgment handed down on: 9 May 2023

1. HIE is a brain injury that prevents an adequate flow of blood to the term infant’s brain occurring as a result of a hypoxic- ischaemic event during the prenatal, inter partum, or post- partum period. National Institute of Health, National Library of Medicine; www.ncbi.nih.gov/pmc/articlesPMC3171747 [↑](#footnote-ref-2)
2. ##  *PG obo TG v MEC for Health Gauteng* (2014/6003) [2021] ZAGPJHC 315 (19 March 2021) @ para [7]; *M obo M v Member of the Executive Council for Health of the Gauteng Provincial Government* (2014/32504) [2018] ZAGPJHC 77 (20 April 2018) @ para [36] to [42]

 [↑](#footnote-ref-3)
3. 2015 (3) SA 266 (GJ) at para 47 [↑](#footnote-ref-4)
4. Joint minutes of the experts: Radiologists p1; Obstetrician and Gynaecologists pp 2-5; Paediatricians: pp 6-11 [↑](#footnote-ref-5)
5. [2016] ZAKZPHC 27 at para [10] – [12] [↑](#footnote-ref-6)
6. 61 of 2003 [↑](#footnote-ref-7)
7. Established in terms of the Health Professions 56 of 1974 [↑](#footnote-ref-8)
8. Clause 9 of the 2016 Guidelines [↑](#footnote-ref-9)
9. *Supra* at para 20; quoted with approval in *PG obo TG v MEC for Health Gauteng*] *Province* *supra* @ para [10] [↑](#footnote-ref-10)
10. Pleadings Bundle: Pre-trial Meetings on: 16 October 2019 @ pp 75-70 (p76); 3 May 2022 @ pp 93-99 (pp 95-99). [↑](#footnote-ref-11)
11. The intrapartum period occurs at the onset of labour until the placenta is pushed out. [↑](#footnote-ref-12)
12. *[MRI Changes in the Thalamus and Basal Ganglia of Full-Term](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)* [by](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Ken Imai](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=Imai%20K%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Linda S. de Vries](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=de%20Vries%20LS%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Thomas Alderliesten](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=Alderliesten%20T%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Nienke Wagenaar](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=Wagenaar%20N%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Niek E. van der Aa](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=van%20der%20Aa%20NE%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)[[Maarten H. 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Benders](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=Benders%20MJ%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [[Ingrid C. van Haastert](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=van%20Haastert%20IC%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)[;](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)[[Floris Groenendaal](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab)](https://pubmed.ncbi.nlm.nih.gov/?term=Groenendaal%20F%5BAuthor%5D)[,](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjStMHnpt7-AhUKSkEAHa8vC-wQFnoECAgQAw&url=https%3A%2F%2Fwww.ncbi.nlm.nih.gov%2Fpmc%2Farticles%2FPMC6191878%2F&usg=AOvVaw1n0p7BqOl0OeYY8qedgrab) [National Institute of Health Journal 2018 Sep; 114(3): 253–260. 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13. “Use *of umbilical cord blood gas analysis in the assessment of the new-born*” L Armstrong \* BJ Stevenson; National Library of Medicine www.ncbi.nim.nih.gov/pmc/articles/PMC2675384 [↑](#footnote-ref-14)
14. See *Bee v The Road Accident Fund* 2018 (4) SA 366 (SCA) at paras 64 – 66 and *Thomas v BD Sarens (Pty) Ltd* [2012] ZAGPJHC 161 at para 9, applied by the Gauteng Full Bench in an unreported case of *M obo LA Child MEC for Health Gauteng Provincial Government* A5015/2020, delivered on 8 October 2021 [↑](#footnote-ref-15)
15. *MEC for Health, Eastern Cape v DL obo AL* [2021] ZASCA 68 at para 24 [↑](#footnote-ref-16)
16. [2021] ZASCA 128. [↑](#footnote-ref-17)
17. *M obo L Child* *supra* at para 35 [↑](#footnote-ref-18)
18. 2012 (1) SA 58 (SCA) at para 26 [↑](#footnote-ref-19)
19. *Khoza v MEC Health & Social Development, Gauteng supra; Madida obo M v MEC Heath Kwa -Zulu Natal supra* [↑](#footnote-ref-20)
20. 2020 (3) SA 377 (SCA) at para 21 [↑](#footnote-ref-21)
21. Basal ganglia and thalamus are paired deep grey matter structures in the brain [↑](#footnote-ref-22)
22. Plaintiff’s trial Bundle: p115 [↑](#footnote-ref-23)
23. Plaintiff Notices Bundle: p84. [↑](#footnote-ref-24)
24. [2019] 4 All SA 1 (SCA) at paras [9] – [18] [↑](#footnote-ref-25)
25. Supra @ para [13] [↑](#footnote-ref-26)
26. *Supra @* para [14[ [↑](#footnote-ref-27)
27. *Supra @* para [19] [↑](#footnote-ref-28)
28. [2018] ZASCA 141 [↑](#footnote-ref-29)
29. [Johan Smith](https://pubmed.ncbi.nlm.nih.gov/?term=Smith+J&cauthor_id=33321532), [Regan Solomons](https://pubmed.ncbi.nlm.nih.gov/?term=Solomons+R&cauthor_id=33321532), [Lindi Vollmer](https://pubmed.ncbi.nlm.nih.gov/?term=Vollmer+L&cauthor_id=33321532), [Eduard J Langenegger](https://pubmed.ncbi.nlm.nih.gov/?term=Langenegger+EJ&cauthor_id=33321532), [Jan W Lotz](https://pubmed.ncbi.nlm.nih.gov/?term=Lotz+JW&cauthor_id=33321532), [Savvas Andronikou](https://pubmed.ncbi.nlm.nih.gov/?term=Andronikou+S&cauthor_id=33321532), [John Anthony](https://pubmed.ncbi.nlm.nih.gov/?term=Anthony+J&cauthor_id=33321532), [Ronald van Toorn](https://pubmed.ncbi.nlm.nih.gov/?term=van+Toorn+R&cauthor_id=33321532)National Library of Medicine www.pubmed.ncbi.nlm.nih.gov/33321532 [↑](#footnote-ref-30)
30. ##  S. Afr. Journal of Radiology. (Online) vol.25 n.1 Johannesburg  2021; *On-line version* ISSN 2078-6778 *“Addressing radiological terminology of basal ganglia and thalamic injury in hypoxic ischaemic injury”.*

 [↑](#footnote-ref-31)