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AUTO+ MEDICAL

RESEARCH TO THE RESCUE

The biggest-ever concussion survey in motor sport is set to change the treatment of drivers worldwide

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INTRODUCTION/

"First, I would like to thank the Editorial Board for giving me the opportunity to say a few words in this edition of AUTO+ Medical, shortly before I relinquish my posts as WRC Permanent Medical Delegate and WRX Deputy Medical Delegate. I have in fact reached the age limit of 75, of which 40 have been spent, amongst others, at the service of motor sport. It was Jean Todt who got me started in the late '70s, by setting me up as team doctor on the Peugeot team for the so-called African rallies, in which he was a co-driver, followed by the PTS team after he had created it.

A few days ago, Ari Vatanen called me to discuss my departure and said to me "you were there at so many rallies, some of which were full of drama". I responded, "Drama, because they were fatal for Attilio or Henri, but others had a more fortunate ending, as was the case for you in Argentina", and he concluded by saying "Thank God".

And this of course is true because, thanks to the determination of some, and in particular since the arrival of Jean Todt at the head of our Federation, who made safety his personal mission, we came out of the darkness and entered the light. Indeed, between the WRCs of the '80s, which were so bereft of safety measures, such as in Argentina in 1985, and what we have in place today, progress has been significant. Moreover, we shall continue to make progress, as we will discuss during our seminar in Saint Petersburg in December.

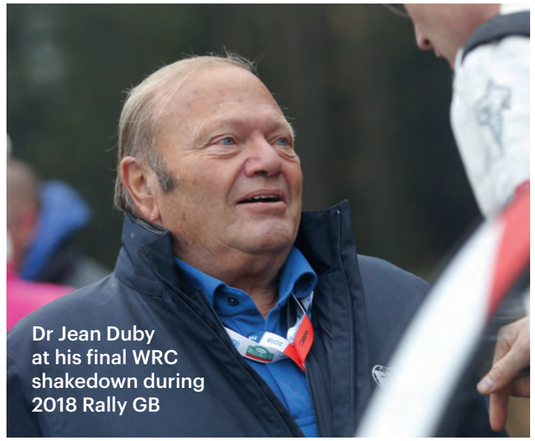
In this edition, two themes are particularly close to my heart.

Grass roots, as discussed in several articles, deserve to be encouraged. The choice of Clare Fisher to lead this work is a judicious one. I was able to appreciate Clare's skills during the Rallies of New Zealand, in which she was Chief Medical Officer. These skills were my reason for proposing her as the next FIA WRC Medical Delegate for the Far East sector, which I hope she will obtain.

Equally as important are the articles concerning concussions. We are seeing more and more of these, not because there are more of them, but because we understand them better. It is essential to recognise them and appreciate their seriousness, and in this respect, I would like to give particular thanks to Professor Hutchinson's team, including Dr Naomi Deakin, who ensures the link between Cambridge University and the FIA. The advances in this field in WRC are indisputable. The difficulties that I had last year in convincing the entire M-Sport team that Julien Ingrassia had to be withdrawn from the competition in Finland are now consigned to history. The recognition of the risk has been fully taken on board, both by drivers and those who are responsible for the team.

All that remains is for me to say *au revoir*, because I will continue to closely follow your activities, and I wish you all the best for the future. Long live AUTO+ Medical."

Dr Jean Duby



Dr Jean Duby at his final WRC shakedown during 2018 Rally GB

CREDIT: ANDRÉ LAVADINHO

GLOBAL NEWS

F1 DRIVER WEIGHT RULES CHANGE FOR 2019

The FIA has finalised plans to introduce a minimum driver weight in Formula 1 for 2019, to ensure that heavier drivers are no longer penalised.

The overall F1 car/driver weight will rise by a further 6kg to 740kg, as the minimum weight for the drivers plus their seat will be 80kg. This includes specially marked ballast that will sit under the seat, therefore reducing the advantage smaller and lighter drivers have had previously over their rivals.

It also reduces the need for drivers to cut down on their calorie intake in a bid to force their weight down, and therefore introduce potential health risks. This allows for teams to decide on their driver line-up late in the season, without the need to take into consideration how much of an impact it will have on their cars' overall weight.

In 2017 the cars became heavier thanks to bigger wheels, tyres and a larger body shape, so the weight limit was increased from 702kg to 728kg. This year the weight was increased further to 734kg, to accommodate the Halo cockpit safety device.

However teams also found that the mountings for the Halo could also weigh up to 15kg, and potentially put their cars over the weight limit with taller drivers. This led to some drivers being told that their weight could end up being an issue again, leading to further fears about their health and general fitness.

The new 80kg limit will mean that a 70kg driver will require 10kg of 'seat ballast' while a 75kg driver will need 5kg.

EARNHARDT JR. KEPT CONCUSSIONS QUIET OVER FEARS OF LOSING DRIVE

NASCAR's Dale Earnhardt Jr. has revealed that he suffered around 20 to 25 concussions during his racing career, and kept them quiet so he would not lose his drive.

In his new book titled 'Racing to the Finish' Earnhardt opened up about his experiences with concussions over the years, admitting that most of these went unreported to anyone, including NASCAR officials.

Given the amount of concussions that he sustained over his career, Earnhardt voiced his concerns that it might affect his memory or personality later on in life. He even revealed that he started taking notes on his iPhone, in case something else happened to him while racing.

"I felt compromised in my head. I felt delicate, and if I was to have another random, rare, high-impact crash that could injure me severely - so severely that I wouldn't be able to communicate properly," said Earnhardt, "I wanted there to be some sort of documentation of what had been happening to me and what I'd been going through."

The two-time Daytona 500 winner highlighted that he was impressed by what NASCAR have done recently to treat concussion, with a mandatory test at the beginning of every season and a traveling neurologist on staff. However, he believes that drivers who do not share information with the series can be harmful.

"I am aware that a driver is their own worst enemy in that scenario," said Earnhardt. "I would do everything I could to protect the drivers from themselves. It would be annoying at times, but my intentions would be to take care of them."

AUSTRALIA DEVELOPS CONCUSSION IN MOTOR SPORT GUIDELINES

The Confederation of Australian Motor Sport (CAMS) has issued new guidelines for concussion management, endorsed by the Australian Institute for Sport.

The set of guidelines recently signed off by CAMS and the National Medical Advisory Committee (NMAC), will help trackside medical and event CMOs to manage suspected symptoms of concussion.

These guidelines were developed to be applicable to all levels of motor sport in Australia, from grass roots and club racing to international competition.

The guidelines issued by CAMS are a series of steps that have been summarised as follows:

1. **Identification and removal from sport**
2. **Deliberate rest for 24 – 48 hours**
3. **Graded return to sport**
4. **Monitoring for repeated episodes of concussions**

The guidelines have been implemented to help anyone who is unsure about concussion management, but are expected to be tailored to the individual driver according to CAMS.

ESPORTS CHAMPION TAKES ON F1-STYLE FITNESS REGIME

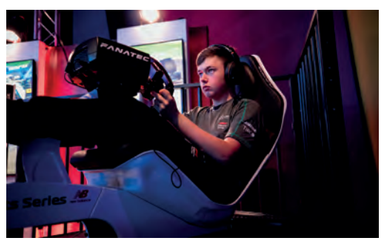
Reigning Formula 1 Esports champion Brendon Leigh, has revealed that he took on a racing driver-style fitness regime ahead of this year's series.

Leigh drives for Mercedes Esports and has emulated the teams real-life success in the gaming world, all with the help of experienced F1 trainer Simon Fitchett who put together a vigorous physical and mental training programme.

"Although in gaming the physical element is nothing like that of a real F1 car, the mental elements are similar, so the principles are the same," said Fitchett.

Last year Leigh made headlines by becoming the inaugural F1 Esports champion in Abu Dhabi. Since then he has made the transition to real cars by taking part in the Race of Champions earlier this year, which he prepared for by losing 20kg in weight.

"The support Simon has given me is without a doubt life changing, not least because I lost nearly 1kg per week in the weeks leading up to the first race of the series" said Leigh. "Losing over 20kg in weight has had huge effects on my life, also a big effect on sim racing."



Faster response system first debuted in F1

FIA DEBUTS NEW CRASH RESPONSE SYSTEM

New crash response technology developed by the FIA made its debut during the Formula One Brazilian Grand Prix in November.

F1 Medical Delegates Dr Ian Roberts and Dr Alain Chantegret outlined how the new system works in Sao Paulo, ahead of the full reveal at the FIA Medical Summit in St Petersburg in December.

The basic concept is to send data to race control without the need for radio and video feedback, which should improve response times from medical teams.

"It allows race control to understand immediately what is happening at the accident site and so resources can be mobilised sooner," said Roberts. "The medical centre can be put on standby for any particular reason.

"It enables things to move more quickly and reliably in terms of the information. This is about the quality of the information and if we can knock off 10 seconds or 20 seconds (to response times)."

The FIA is already looking to introduce the system to series other than F1 such as rallying, where a limiting factor to rapid response is often the distance between race control and incidents.

"It's important on the circuit but I think it will be more important in rallying," said Chantegret. "You can have race control somewhere and a crash 200km away, and with this device we can have the rapid assessment immediately. We can go by satellite, and it's not necessary to go by car to see [what has happened]. It's a very big step."

SAFETY ISSUES RAISED BY FIA ON UGANDAN RALLY

The FIA has asked the Federation of Motorsports Clubs of Uganda (FMU) to increase safety at national rally events, following an incident at Festino Cite.

During the FMU Championship Sprint event in Mukono, a rally car veered off track and into spectators. Although there were no major injuries, it exposed safety loopholes in the event that often features large crowds and follows similar incidents that happened during the Masaka and Fort Portal rallies earlier this year.

As a result the FIA is now asking the National Sporting Authority (ASN) to enforce more "aggressive measures" towards safety, with the FMU already implementing several safety measures to ensure crowds are controlled during sprint events - including the creation of barriers and barricades that keep fans away from the racing line.

With the addition of a sporting grant given to the ASN, the FIA is keen on seeing more progress in safety programmes, to help stop further occurrences of safety risk being a problem at future events.

This follows the safety tank rule that was implemented ahead of the fifth round of the Africa Rally Championship in July, whereby the use of a safety fuel tank is compulsory for all competitors during FIA events.

UK REGISTERS 10,000TH MARSHAL

Motorsport UK (previously MSA UK) issued its 10,000th marshal registration for the first time, marking a major milestone for the National Sporting Authority.

"We should always look for new ways to recruit and retain volunteers through further recognition and rewards," said David Richards CBE, Motorsport UK Chairman, who also cautioned against complacency. "It will not happen overnight, but in time I believe we can put the right initiatives in place to ensure that the volunteering community continues to thrive well in the future," he added. "Motorsport UK thanks every one of its 10,000 registered marshals for their invaluable contribution to motor sport in the UK."

This comes a year after the British Motorsports Marshals Club marked its Diamond 60th anniversary, celebrating those who provide 40,000 days of marshalling across the country.

UK Marshals can now renew their registrations for 2019, with over 1,500 already registering within the first week.

KASEY KAHNE SUFFERS HEAT EXHAUSTION

NASCAR Cup driver Kasey Kahne will not contest the final rounds of the 2018 NASCAR Cup series, due to ongoing health issues following a race at Darlington in September.

Post-race Kahne experienced "extreme heat exhaustion," and needed to be taken immediately to the medical centre, where he was sick several times on the way and ended up receiving IV fluids in both arms.

The episode came just a month after Kahne announced his retirement from full-time NASCAR competition set to take place at the end of 2018, admitting that an ongoing health issue relating to difficulty in keeping himself properly hydrated during races was a factor.

"There were times last year when I definitely felt it," Kahne said during a press conference at Indianapolis. "This year it's been much more consistent. I feel good the first part of the race until I lose that amount of fluids. At that point it's when it starts going that direction, I can't keep back up."

He subsequently missed four races since Darlington, with Regan Smith replacing him. He then tested a car at Charlotte Motor Speedway at the end of September, but he was not medically cleared to return to racing.

"Out of the race car I am perfectly healthy, I feel great, and the doctors have determined that I have no underlying health problems," said Kahne. "My body just can't handle extended periods of time in the race car and we weren't able to control the sweat ratio to keep me hydrated enough to prevent any permanent damage to my body."

MOTORSPORT UK TO CONDUCT REVIEW OF SAFETY EQUIPMENT

Motorsport UK will conduct an in-depth review of competitor's safety equipment over the next two years, with the aim to reduce the burden on competitors by unnecessary replacement of seats and harnesses.

The move will "ensure suitably high standards of safety" are maintained when it comes to safety equipment use in motor sport, and provide greater education for competitors of their own safety.

The board has approved the following FIA-homologated seats and harnesses in the UK for extended life:

- FIA 8855-1999: Seats that have this standard in stage rallying are granted a two-year extension at the end of their initial five-year life.
- FIA 8853-2016: Standard granted ten year-life across disciplines. This homologation is for six-point harnesses as a minimum.

In addition, Motorsport UK will be publishing new guidance on installing seats and harnesses, while giving scrutineers further training in this area.

AUTO+ MEDICAL VIEW FROM THE GROUND

VIEW FROM THE GROUND:

DR CLARE FISHER

MEDICAL OFFICER, KARTSPORT NEW ZEALAND

In the latest column from the frontlines of grassroots motor sport, Dr Clare Fisher gives her views from the ground in New Zealand.

“**I have been working as a medic at motorsport events for 19 years.** I started out as a track medic at Cadwell Park circuit in Lincolnshire. I was shoulder tapped by a colleague and then fell in love with it. Then I came to Auckland, New Zealand in 2003 to do my Anaesthesia Fellowship, where I met my husband - a fire-fighting Kiwi working on WRC Rally New Zealand - the rest is history. I am now happily a resident in the country working as a Specialist Anaesthetist with our young family.

The grassroots scene in New Zealand is very active and growing. Year on year license numbers for all disciplines are going up. The way medical services are organised for events in New Zealand, the cover for grassroots events is provided primarily by ambulance personnel. The requirements range from someone with a first aid certificate to the level of Intensive Care Paramedic. International events require the need for cover by doctors. These arrangements in themselves cause problems with retention of interested volunteers (which I know is a worldwide problem) and training those people.

We can split training for medical teams in New Zealand into a number of stages. The first is selection for the team; doctors need to be from a suitable in-hospital background with appropriate in-hospital (or if we’re lucky pre-hospital care) experience and skills. Then there is pre-event; informal discussions with the doctors involved, formal event briefing, introduction to equipment and environment. We then have event specific; for example Rallies, extrication practice on our ‘dummy cockpit' and V8 Supercars which features car familiarisation and extrication practice.

We have a good relationship with the other race class organisers and endure familiarisation with all race categories. We are fortunate to have an active paramedical motorsport team and use them as a buddy system to share their knowledge with new doctors.

Fisher also works in V8 Supercars and WRC

Working at national circuits in the UK, I learned the importance of a good symbiotic working relationship with your paramedical colleagues. We all have our own unique skill sets which truly complement each other. I was unfortunate enough to have had fatalities on days I have been working at tracks in the UK and while it was truly horrific at the time it taught me a lot clinically, emotionally, logistically and medico-legally.

The CIK/FIA has introduced many safety initiatives over the last few years to do with driver safety. In New Zealand we have been developing guidelines and standardising requirements for medical cover at tracks and licensing requirements with the aim of creating uniformity at all tracks. Other non-medical systems improvements have also been made, for example more secure dummy grids, electronic flags, start lights, race director stands, development of full track coverage with camera systems. We also currently have one karting circuit in New Zealand built to CIK specifications, but none built to FIA specification yet. There are 3 further tracks in progress also being built to CIK specifications.

In grassroots motor sport, you have to be prepared, plan well and be flexible. Expect the unexpected – I now know how to ring 0800 BEEKEEPER – picture a swarm of bees forming on a fence out the back of the pit garages! Be appreciative of your volunteers work - they are hard to keep!”

AUTO+MEDICAL FEATURES

FEATURES

RESEARCH TO THE RESCUE

Unreported instances of concussion are a growing problem in motor sport but a new wide-ranging project is looking to change that by researching and documenting hundreds of instances of concussion in motor sport worldwide.

Concussion is an issue in motor sport. The trouble is that no-one knows how big of an issue it really is.

An ambitious new study is looking to change all that. RESCUE-RACER is aiming to become the biggest-ever concussion project in motor sport and could lead to major changes in the treatment of post-accident drivers across the world.

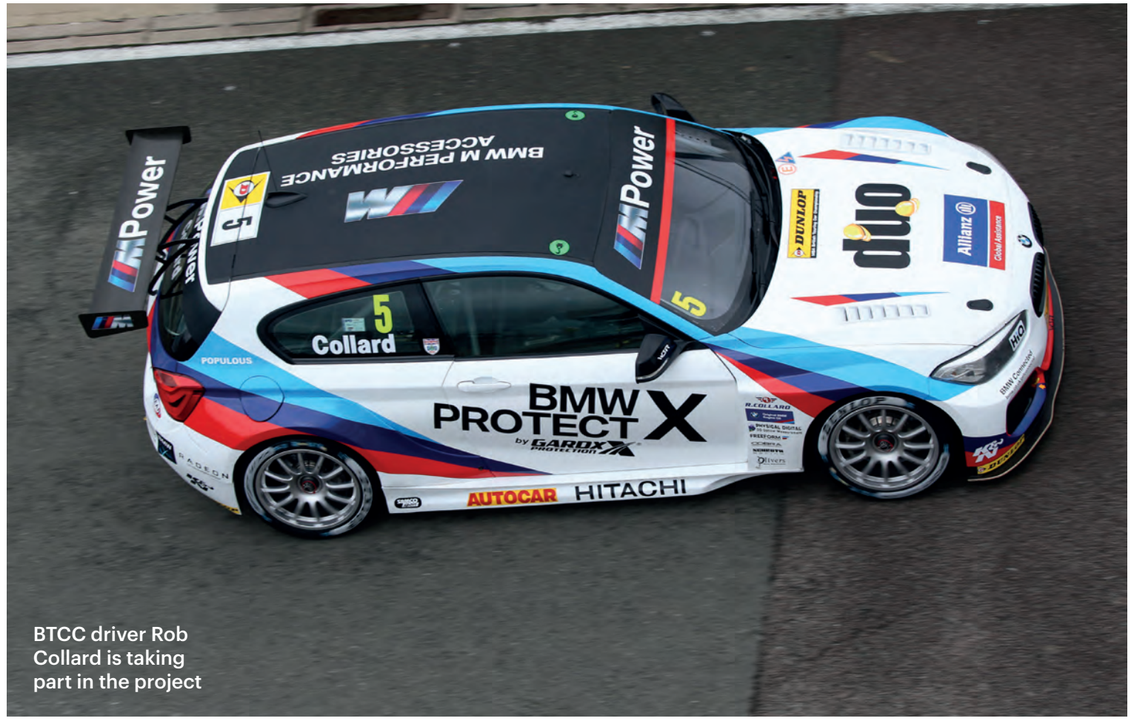
The project – which stands for 'Research Evaluating Sports ConcUssion Events; Rapid Assessment of Concussion and Evidence for Return' – is being led by this year's Watkins Scholarship winner Dr Naomi Deakin, with funding from the FIA and support from the University of Cambridge and Addenbrooke's Hospital. Deakin's research is supported by Professor Peter Hutchinson, Professor of Neurosurgery in Cambridge and Chief Medical Officer for the British Grand Prix.

The aim of the project is to consult drivers around the world by investigating their concussion events, understanding their symptoms, and assessing how they return to racing.

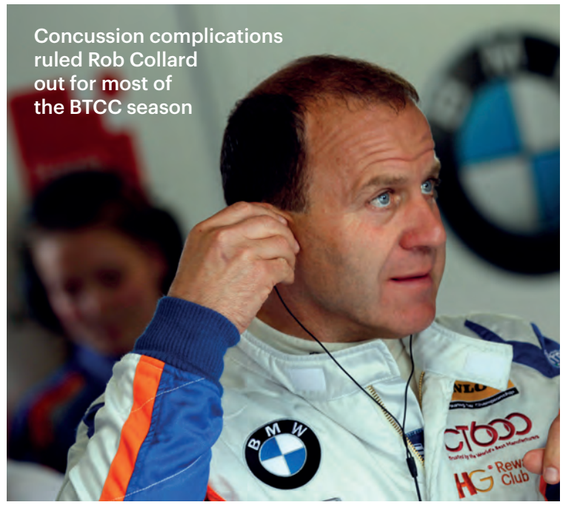
All too often concussions are going unnoticed and symptoms can often reveal themselves long after an incident.

Veteran British Touring Car Championship driver Rob Collard knows this only too well after having to miss half the season this year following a re-emergence of symptoms from an incident the previous season.

"When I went back racing this year, even though I passed my concussion tests, I drove the car a few times and I had quite severe



BTCC driver Rob Collard is taking part in the project



Concussion complications ruled Rob Collard out for most of the BTCC season

"BY INVITING A LARGE NUMBER OF DRIVERS TO TAKE PART WE HOPE TO FIND OUT MORE ABOUT CONCUSSION IN MOTOR SPORT"

headaches coming back," says Collard. 'Then I had another accident in July this year at Snetterton. The medical team looked into it and advised me that it's not safe to race because again, that was quite a high speed accident where I went into the wall backwards. The doctors looked at my eyes, did a test and the concussion was back."

Collard will be one of the first drivers to take part in the project and his story demonstrates the difficulties of concussion diagnosis. Symptoms can often lay dormant until another incident brings them to the fore.

With the information gathered by RESCUE-RACER, doctors may be able to identify these symptoms before a driver is put back into competition prematurely.

DUAL STUDY

The data will be split into two studies: CArBON and CARS. CArBON – which stands for Competitor Assessment at Baseline; Ocular, Neuroscientific – is a baseline study that collects neuroscientific data to find out how well a driver's brain functions pre-accident. CARS – which stands for Concussion Assessment and Return to motorSport – is the post-injury analysis and will be completed as soon as possible after injury if the driver is fit, using the same assessments as CArBON with the addition of head impact data from in-car or in-ear sensor technology. In addition, drivers participating in CARS will be re-examined at one, two, and three weeks after their accident.

"The reason that the CArBON study is important is because we know that racing drivers have a different set of reaction times and processing speeds, compared to other adults and even athletes," says Deakin. "So it's important that we collect a good cohort of data to see how that changes across different categories of the sport and at different ages.

"We're effectively investigating six different assessments; three that are currently being used in motor sport, either for diagnosis of concussion or for prognosis (how things change over time). Then there are three tools that might be useful, but are new to the motor sport environment."

The assessments already in use include the I-PAS device, recently introduced by IndyCar, which measures eye movements, inner ear function, and reaction time. There is also the 'Sports Concussion Assessment Tool' – also known as 'SCAT5' – a 15-minute paper-based test that looks at simple word and number memory, as well as the ImPACT test that is an extension of that, designed around reaction

time and memory, which has been used in motor sport for decades.

Another assessment being investigated for the motor sport environment is the 'CANTAB' test. This is a computerised exam that focuses on thinking and memory, exploring problems that may occur a long time after the accident.

A final method of analysis is a saliva sample, similar to a study currently being conducted in Premiership Rugby in the UK, to see whether saliva could be used as a diagnostic test.

To help explore the effectiveness of these, RESCUE-RACER is utilising a very specialised type of MRI of the brain that can reveal structure, function and different levels of metabolites such as oxygen, and connections between different parts in the brain. This is further enhanced by the access that researchers have to a specialised 7-T scanner, which gives better resolution when it comes to brain scans.

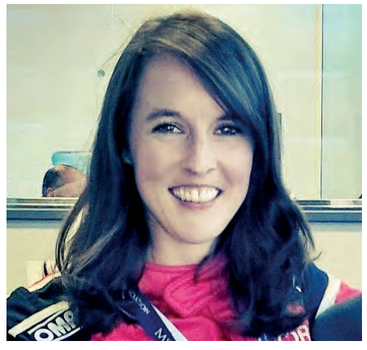
BREAKING THE TABOO

Through the use of these advanced tools, the aim is that the RESCUE-RACER concussion project can provide a centralised database of information on motor sport concussion and advise doctors around the world on how to handle symptoms in racing drivers for any series – not just those racing in championships sanctioned by the FIA or Motorsport UK.

"Surprisingly there are very few studies that look at concussion in motor sport," says Deakin, "So as far as I'm aware this is the first project whereby we gather a large amount of clinical data and look forward to motor sport accidents before they happen. This study is not only based in Cambridge; the CArBON study will be open to competitors that compete in the UK's TOCA series, comprising championships such as BTCC and Porsche Carrera Cup GB. But CARS, the post injury study, is open worldwide and being supported by the FIA. We hope that by inviting a large number of competitors to participate, we can find out much more about the prevalence of concussion across motor sport."

However, there is still the issue of unreported instances of concussion. Former NASCAR driver Dale Earnhardt Jr. recently revealed that he suffered around 20 to 25

"I THINK YOUNG DRIVERS DON'T GIVE ANY SORT OF CREDENCE TO CONCUSSION, BUT NOW I SAY 'YOU MUST TAKE THIS SERIOUSLY'"



Dr Naomi Deakin is leading the project

RESCUE-RACER will use data from I-PAS and other tech

Concussion symptoms can often go unnoticed after an accident

concussions in his racing career. At the time he did not tell anyone through fears that it might affect his competitive advantage, or how people perceive a bad result.

With concussion being a difficult thing for doctors to diagnose, they are often reliant on the patient telling them whether they have symptoms. But as studies become more prevalent, and projects like RESCUE-RACER give drivers more of an opportunity to open up about concussion, it could become less of a taboo subject amongst drivers.

"I think young drivers don't give any sort of credence to it, but now I'm saying to them 'No, you must take this seriously guys, this is very serious'", says Collard. "It's very important that the medical studies continue and they gain pace because concussion is something that's unseen. You can't see it, you can't feel it, you can't touch it, unlike a broken bone.

"Racing drivers have broken arms and legs and stuff like that, and they're easy to see and relatively easy to fix. Whereas the concussion that I've experienced a few times now, I've probably underestimated the effects and severity of it. A lot of drivers didn't give it any respect and probably didn't understand it as well.

"But now people are, and I think that's predominantly from other forms of sport whether it's boxing or rugby, people now understand it a lot more and it's not a taboo subject where people keep quiet about it. It's ok to talk about it."

Pro Peter Hutchinson, Chief Medical Officer for the British GP, is supporting the project

MULTI-DISCIPLINARY APPROACH

Once the research data collected from RESCUE-RACER has been analysed, the ultimate goal will be to change the guidance surrounding how drivers are able to return to racing, so doctors can have a greater say in when competitors can continue to race or return to full-time competition.

"Currently in the UK, the Motorsport UK concussion guidance says 'If there is a suspicion of concussion or a diagnosis, then drivers are suspended from racing for three weeks,'" says Dr Deakin. "But we do know that in general sports-related concussion, 80 per cent of concussions resolve in 10 days. So you

> **"THE AREA WHERE THIS STUDY CAN PROVIDE INFORMATION IN OTHER SPORTS AND FIELDS IS THROUGH CAUSATIVE DATA"**

can see that there is a mismatch between the motor sport guidance given and the guidance in other sports. So we're going to review drivers serially throughout that post-injury period and see whether current guidance is adequate, whether it needs shortening or perhaps lengthening."

Doctors will also have access to engineering data, which can be used in conjunction with the medical data they have gathered. This will be from accelerometers that drivers have in their ears, accident data recorders, circuit footage, and in-car footage.

"We actually don't know what the threshold for concussive injury is. We know it would be somewhere below 100G but don't yet understand the characteristics of the pulse involved," says Deakin. "And if we can understand that, then we can start to bear that in mind for the design of head protection systems, cockpit protection, and barriers, hopefully then bring down the incidence of concussion."

Along with the change to medical safety standards in motor sport, Deakin hopes that RESCUE-RACER will benefit other sports on how they deal with concussion. It could also contribute to an understanding of how concussion can occur in road traffic accidents.

"The one area where I think this study could provide information to concussion in other sports and other fields is through the causative data," says Deakin. "Although it may be possible that we have a slightly different concussion profile in terms of motor sport, there are obviously striking similarities to the concussion you might get in road traffic accidents. There are already systems out there that collect some data but I think the data that we collect would really be able to inform other sports and other practitioners who go on to design protective systems or guidance that would help to reduce those impacts."

The collaboration between motor sport medicine and engineering will be key to developing a global understanding of concussion. And to putting in place both medical and engineering solutions to mitigate concussions and deal with them more effectively when they do occur.

This might be an ambitious project but Deakin and her team are ready to tackle it head on.

For more info on RESCUE-RACER, visit: www.rescueracer.org

Dale Earnhardt Jr kept concussions secret through fears of losing his drive

DR PAU MOTA

Head of Medical, FIA

Dr Pau Mota is the first medical doctor to be employed full time by the FIA. He is planning to utilise his background in medicine and motor sport to drive forward the work of the FIA medical department as its new Head of Medical. *AUTO+ Medical* spoke to him about his new role and ambitious plans for the future.

AUTO+ Medical: What is your background in medicine and motor sport?

Dr Pau Mota: Initially I did a degree in Geography at the University of Barcelona. Then I started my medical degree and did a PhD in Geography with a six-month research fellowship at the University of Auckland in New Zealand at the same time. When I was around 30 years old I went to St Andrews University in Scotland for a postdoctoral fellowship. I finished my medical degree and I became a lecturer at the university in Barcelona.

Then after two years when I finished my postdoctoral fellowship I moved to Switzerland to do my first medical internship. I did one year of general surgery and two years of orthopaedics, and then I worked in emergencies, pre-hospital care and general medicine at the CHUV (University Hospital in Lausanne) focussing on emergencies and pre-hospital care. Whilst there I moved up to the position of Chief of Residents and Research with a focus on epidemiology and public health.

Throughout this time I also followed my passion for motor sport. My family has always been involved in motor sport. At the Circuit of Catalunya in Barcelona my cousin is the current sporting manager, and my aunt is the sponsor manager of the WRC of Spain so I used to work as a marshal and paramedic on that since I was 15 years old. Then I worked as a paramedic and doctor volunteer at the track during my free time. When I moved to Switzerland, as there are no circuits, I started working on some rally and hill-climb events, always working as a medical doctor on the ground.

A+M: How did you come to join the FIA?

PM: I just saw the advert for the job in December on the website and I sent an email with my CV and started a series of interviews. They were looking for someone who could support the medical commission and the medical delegates in a more formal way with a full-time medical doctor in the department. And I was hired because of my background in research, emergencies and pre-hospital care, as a specialist in internal medicine and with a lot of passion and some experience in different series of motor sport.

For me it is a big challenge because I will give up a good hospital position for what is more of

Dr Pau Mota joined the FIA as Head of Medical earlier this year


Rescue teams in F1 are known for rapid response

a management position. And I'm 40 years old so it's kind of a risky change in my life but I said 'yes, I love motor sport and I want to take that risk'. To be honest, since I've been here I've seen there are plenty of projects and ideas that were there for ages and now with a full time doctor working in the department we can move on. Every time I sit down with Prof Gérard Saillant (FIA Medical Commission President) new ideas come across.

A+M: So what are these plans that you have for the future?
PM: Motor sport is the only sport in the world where you can see the prehospital care in its totality, in action. It's probably the only sport on TV where you can see bits of what is done every day on all the roads of the world when an accident happens. For me, every rescue team and pre-hospital care mission in an FIA Championship must be known worldwide as performing the leading edge on pre-hospital care standards, just as mechanics do when changing tyres in Formula 1.

Our main duty in the Medical Department is to provide support to the Medical Commission and to the Medical Delegates and Chief Medical Officers to help them on the ground. Our two main priorities are: provide the highest standard of care, using high tech equipment and focused on specialized training; and the fastest possible.

A+M: What are the key issues that doctors face at the track?
PM: To get to an incident as fast as they can and to have the maximum information that you can before you get to the accident. So from the moment that you're in the medical car you need to be getting information from the scene of the accident and information about the driver and his/her state at the moment. When you arrive at the incident, you will then have the maximum amount of information to help get a possible diagnosis as fast as you can and to mobilize all the resources to give to the driver, who has become a patient, the best care.

So gathering all the information you can from the driver, what happened, how it happened, all help to quickly assess the patient and get him to the right place.

A+M: That's easy to do in F1 where there is a lot of money and resource for that technology, how can you achieve that in grassroots?
PM: Currently we have several projects to achieve the cascading down of the approach in F1 to other championships. This is one of our priorities and one of our missions, to bring the highest standard of care to all motor sport events organized by the FIA, and a further step to transfer all that knowledge to road safety. In every country where we have a world championship event, they have good health services, and health practices are one of the most regulated and government-controlled human activities, so we have a solid start.

"EVERY RESCUE TEAM IN AN FIA CHAMPIONSHIP MUST BE KNOWN WORLDWIDE AS THE LEADING EDGE ON CARE STANDARDS"

A+M: You have a team at the FIA now, can you tell me more about who is on the medical team?
PM: Yes of course. We are three people, including myself. We have Magali Louis, our Medical Coordinator. She has a PhD in Neurosciences and has done a lot of work with international sports federations in the past. Magali acts as a liaison with the Medical Delegates and ASNs for FIA World Championships, organises the CMO Seminar and Medical Summit and is in charge of the Disability and Accessibility Commission.

The other Medical Coordinator, Prisca Mauriello, has a background as a lawyer and holds a Masters in Sports Law. She is in charge of the Anti-doping Affairs, which includes the controls, compliance and result management. In addition she is in charge of the implementation of the FIA anti-alcohol regulations.

A+M: Sounds like you've got a strong team with some good qualifications, are you confident you'll get all your plans through?
PM: Yes, we are a very strong team, young, competent and very well trained to drive all the projects from our Medical Commission and Medical Delegates to continue leading medicine in motor sport. With Professor Saillant's support and leadership, everything is possible. We will work closely with the Medical Commission, that runs three times a year, and have a practical approach always being in contact with what happens on the track. Then it's just a question of hard work, and that is the first thing that we will deliver.

Dr Mota wants to transfer medical knowledge from motor sport to road safety

Medical teams practice extrication every race weekend in F1

INSIGHT: EVOLUTION OF EXTRICATION

How to remove an injured driver safely from a car is one of the most important skills to learn for trackside medical teams. **Dr Paul Trafford** and **Dr Ian Roberts** examine the evolution of extrication and give their opinions about the latest thinking on the topic.

As vehicles have developed, so the protective envelope around the competitor has increased, both in terms of offering increased protection, but also in its complexity. In the FIA Word Endurance Championship for example, a knowledge and understanding of the vehicle structure is essential in order to understand what is necessary and what can be done, and there is no substitute for hands-on practice with an experienced extrication team.

Dr Jean-Jacques Issermann is probably the single most influential expert involved in extrication. For the past 70 years he has dedicated his life to motor sport and ensuring extrication techniques and methods as well as training have been, and remain, at the forefront of FIA requirements. In 2014 along with several of the FIA Medical Delegates, and with support from the FIA, ACO and FFSA, the first international training programme was held at Le Mans, with attendance by representatives from Spain, UK, Belgium,

Germany, Portugal, Holland, Japan, Argentina, Australia, USA, Canada and South Africa.

The extrication course had been developed and taught by Dr Issermann around the world, but this was the first time extrication teams and delegates came together to learn and practice on a range of vehicles, including the newly built FIA F1 extrication simulator, Toyota's Hybrid Le Mans car, the Audi WEC car, and representative vehicles from the world of rally, single seaters and GT. This event has now become the benchmark for extrication training and is well worth attending. This year's event introduced the Halo to the teams and delegates and in addition to the vehicles used previously, there were two LMP2 prototypes, a Chevrolet corvette, three GT3 Porsches, two GP2 single seaters, two F4s and one Formula E car.

EXTRICATION TEAM

The concept of the Extrication Team was made compulsory in 1990 for all FIA World Championship events and this has been adopted by several other events trackside. Each team consists of a crew of six, one of whom must be a doctor or paramedic. The Chief Medical Officer of the event is responsible to ensure the Extrication Teams have been trained and are competent.

The training has always been rather didactic and structured, initially being necessary to cope with the extrication seat used in F1 and other single seater series, but as the issues to overcome have become more complex, sometimes it is necessary to think outside the box and make quick decisions based on experience. This is why an enthusiastic regular team that trains and works together is the best option rather than a team that is brought together for one event a year.

RALLY AND OFF ROAD

Rallying and off road events present a completely different set of complexities with no formal extrication team existing and a vehicle with not one but two competitors to deal with. In these circumstances it often takes some time to get a rescue crew or medical assistance, and where it is safe the competitors are allowed to remain in the vehicle until skilled assistance arrives. Even then, there is no formal extrication team and various crews have to work together under medical direction. Rallying has its own techniques such as the Rautek manoeuvre allowing a single rescue worker to get a driver out in an emergency.

CERVICAL COLLAR

The use of the rigid cervical collar is controversial, with many first responders world-wide moving away from the hard collar, citing the lack of evidence for their use and problems that can occur which outweigh any benefits. Many National Guidelines now acknowledge this. We have included at the end of this article references the reader may find interesting. There is a massive difference however between the forces involved in Motor Sport compared to a road car. The passive and active safety systems in a race car are also vastly different to those found in a road car. Direct comparison is not easily made and it is not sensible to translate the mechanism of injury that occurs in a road traffic collision to a motor racing accident and any decisions about using a rigid cervical collar must have a sound basis.

The use of cervical collars and splints in motor sport undoubtedly warrants further discussion, however the authors feel that if an experienced physician is present, he/she should be allowed to make the decision based on clinical judgement and the nature of the accident. If the physician or team is inexperienced, or there is any doubt, or the physician is not completely satisfied there is not a problem, a hard collar should still be used in motor sport.

There are a lot of physicians involved in motor sport. The question arises of who is experienced to make that decision and what experience is necessary. Is a senior doctor who works in a hospital environment experienced to make the decision? Maybe not, unless they have attended numerous motor sport events, been involved in attending many accidents, seen a range of injuries and scenarios and are able to justify to others and a court of law what they did and fully understand the consequences of any decision. You must be able to justify any decision you make.

Extrication seats are used to remove drivers across multiple series

WHAT IS EXTRICATION?
In Motor Sport the term "Extrication" is the process of getting a competitor out of a vehicle. If the vehicle needs to be cut apart to release a trapped driver, then we use the term "Disincarceration". Note: "Extraction" is sometimes used incorrectly and as Dr Jean-Jacques Issermann would say, it should be confined to pulling out a tooth!

EXTRICATION SEAT

This was developed by the Lear corporation specifically for F1. It has now found its way into several championships, yet has never been popular in the USA where the spinal board or short spinal board are used routinely instead, extricating the driver alone

without the seat. There are advantages in being able to remove someone without moving the spine significantly but there are also disadvantages. In F1, every seat is slightly different with its own peculiarities and it is not easy for the teams at each event to familiarise themselves with these cars. In other formulae the seat is often poorly fitted as it is put in and out of the car by engineers with straps and attachment points being taped in inaccessible locations without any thought of their function. Rarely, a seat may be trapped in a tub if any damage has occurred, making lifting it out impossible. The seat itself may also be damaged which will not be immediately apparent. It is imperative that for every seat a test is made to ensure the head support section fits properly and the straps can be attached.

One of the biggest problem is transferring a competitor from the seat once out of the vehicle onto a vacuum mattress or other transport device. Great care must be exercised as the extrication team lifts the driver and extends the legs at the hips to lie them flat, the team must be perfectly coordinated to limit any spinal movement.

OBSTACLES / HALO

In both open and closed cars, there can be many obstacles to extrication which may need to be resolved before a formal extrication can begin. In closed cars the racing nets and window nets need to be removed, doors fully opened or removed as well as any roll cage blocking the route. It may be necessary to take the windscreen out or cut the roof off the car or cut pedals. In all cases the injured trapped competitor is the main focus of activities. They should always

Drivers should be checked even if they get out themselves

be protected from any associated environmental hazards, monitored closely, and told what is happening if they are conscious. Cutting vehicles can be noisy and frightening for those trapped.

The driver's helmet may need to be removed. This can be difficult in closed cars and should be practiced, remembering to disconnect all communication wiring and drinking tubes. The use of the “lid-lifter” balaclava, if worn, can be extremely useful in these circumstances where room permits.

The Halo additional frontal protection deserves special mention. Introduced into F1 in 2018 and now other championships, it is soon to be introduced into F4 world-wide. We have seen many accidents now where the Halo has proven itself and we have yet to see an accident where it has presented a problem to extrication, although this has to be something to be prepared for. It is possible the Halo could be distorted sufficiently to prevent the driver being removed in his/her seat, but still allow the driver to be removed without his/her seat. It may have to be cut to allow extrication in severe cases, but this warrants a separate discussion.

TRIAGE AND EXTRICATION

The focus at all times of any extrication must be the competitor.

Where a competitor has been involved in an accident, he/she may well have no injuries and get out themselves – Self Extrication. This may occur before any physician has arrived on scene. It does not mean the driver is completely ok and he/she should be checked over either on scene in an ambulance, or at the medical centre, based on the circumstances of the accident and his/her behaviour / symptoms. Always think concussion if a driver is behaving erratically.

In an effort to simplify the process, the following flow chart may be useful although it is not meant to be followed rigidly – every accident is different and every injured driver unique.

EXTRICATION PROCESS

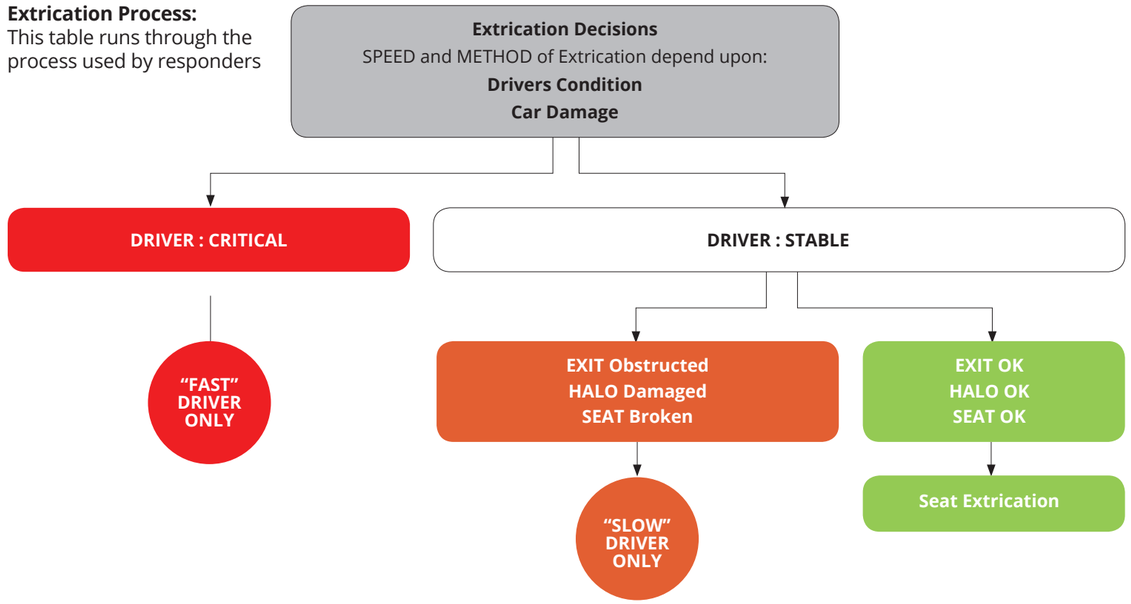
The decision how and when to extricate a driver should be made based on the following:

- The injuries and condition of the driver
- The nature of the accident and mechanism and damage to the vehicle
- The safety of the scene – fuel, fire, weather, etc...
- The resources available

CRITICAL

Where circumstances dictate e.g. fire, or the driver is critical with life threatening injuries,

Extrication Process:
This table runs through the process used by responders



“THE DRIVER MUST BE MONITORED AT ALL TIMES IN CASE THE EXTRICATION NEEDS TO BE TO MORE URGENT”

he needs to be extricated as quickly as possible – Fast Extrication. In these circumstances, both in single seaters and closed cars, the driver should be removed manually without using a removable seat or other splints, attempting where possible to maintain in line stabilisation of the neck and spine. In rallies where there may be little immediate assistance, the Rautek manoeuvre should be considered.

STABLE

Where the driver’s condition is stable and there are no other circumstances dictating an urgent extrication, we can consider two options.

In the best case scenario in green, the extrication route is not obstructed, the Halo has not been distorted or blocking the exit, and the seat appears ok. In such circumstances in single seaters where there is a removable seat, a formal extrication using the seat should be undertaken, calmly following the methods taught, remembering to constantly communicate with the driver ensuring there is no deterioration in his condition. In closed cars there is no removable seat and a calm planned extrication using appropriate splintage where necessary should be undertaken. In rallies it may be necessary to wait for further assistance.

In the case of a stable driver but some obstruction to extrication, such as a structure blocking the cockpit exit route, damage to the Halo making use of the seat impossible, or difficult, or where the seat is broken, the space may still be big enough to extricate the driver alone slowly and carefully without using the seat. Again the use of appropriate splints if necessary should be considered. Where intervention is necessary to spread structures apart, or to cut a roll cage or Halo, then appropriate rescue equipment will be necessary with experienced rescue workers. At all times the condition of the driver must be monitored in case the extrication needs to be upgraded to more urgent. The driver should also be constantly kept updated by the same person throughout the procedure.

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Obstacles must be moved before extrication takes place

POINTS TO REMEMBER

- **Always remember to communicate with the drivers all the time – if they are conscious they may be in pain and frightened and a reassuring voice can be really important.**
- **Ensure their condition does not deteriorate during the extrication, it may be necessary to upgrade the extrication at any point to a faster one.**
- **Use your clinical judgement and skills.**
- **Ensure Race control is updated regularly regarding the urgency of the situation and the status of the driver. This will help them determine when and how further resources are sent to you.**
- **Once the driver is out, remember they still have to be secured for transport either to the medical centre or hospital.**
- **Practice and familiarise yourself with the equipment and vehicles.**

INSIDE ALEX ZANARDI'S DTM CAR

AUTO+ Medical takes a look at how BMW adapted its DTM car to accommodate double amputee Alex Zanardi.

One of the most remarkable stories in modern motor sport is the comeback of Alex Zanardi, who continues to race competitively despite having both of his legs amputated following a major crash during a CART race in 2001. But for his appearance at the Misano round of the DTM championship earlier this year, Zanardi raced with a car adapted by BMW engineers for use only with his hands, marking the first time he has raced without prosthetic legs.

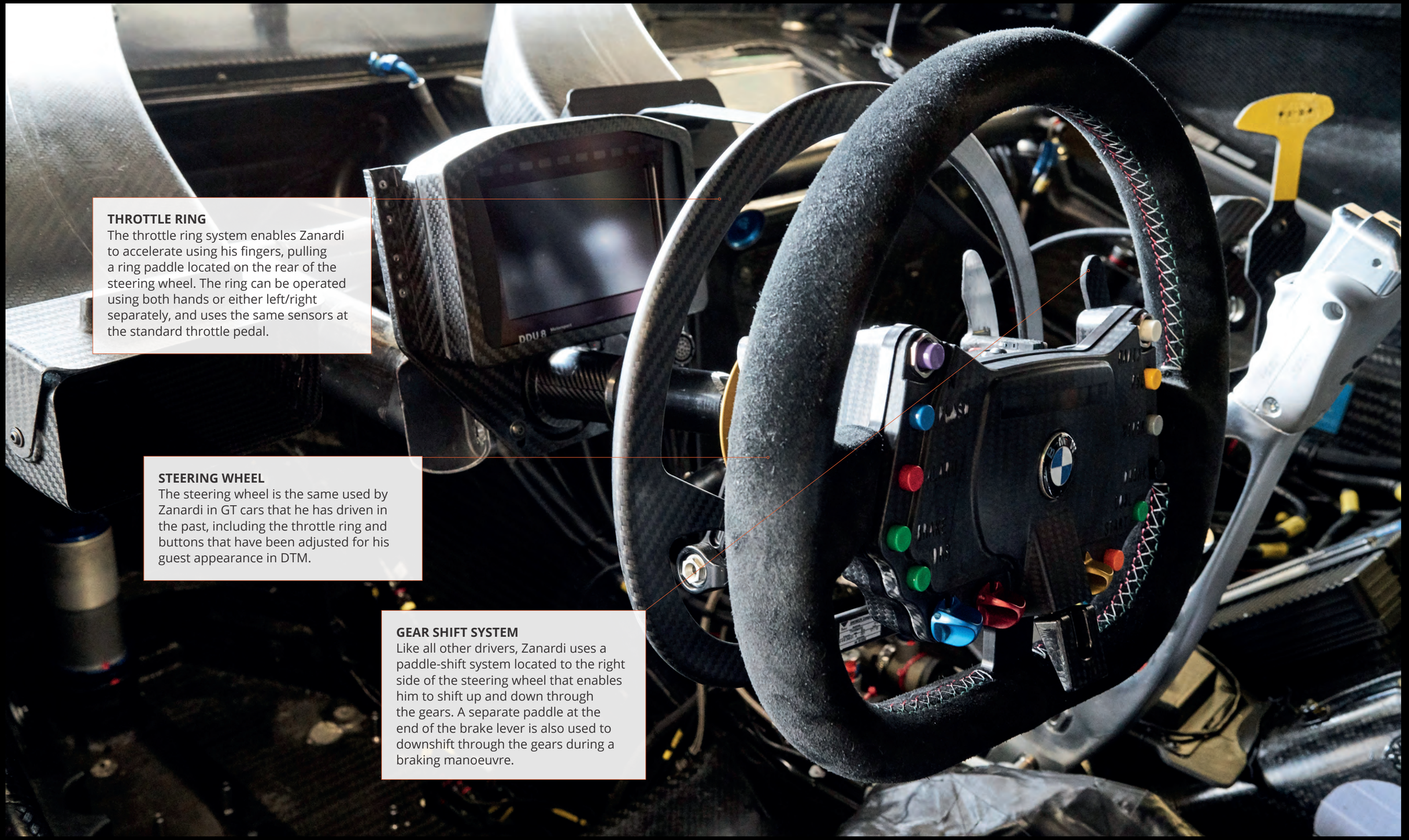
The special adaptations were made specifically to allow him to accelerate and brake using just his hands, which Zanardi believes makes him more agile in the cockpit.

"I am much more agile than with the legs on to get in and out the car," says Zanardi. "It is ten times easier for me. I can't use my legs for any other purpose than a leaning point. I have to drag them into the car using the strength of my arms, which I also need to raise the weight of my body. So without the legs I have nothing interfering in the movement and I have less weight to move around."

He was also well prepared from a safety point of view, having trained extensively to get out of the BMW M4 DTM while wearing a helmet and HANS device within the seven-second time limit. "The plan is to get to the car with my wheelchair and to then jump into the cockpit, then the same way to get out," says Zanardi. "There are plenty of handholds in a DTM cockpit that I can use to pull myself out. I wouldn't say that I am faster at getting out than the other DTM drivers but I am certainly no slower."

Although Zanardi qualified in 19th for both races at Misano, he managed to get 13th in the first outing and then a top five finish in 5th place in the second. After his successful DTM outing this year, Zanardi will join BMW's assault on the Daytona 24 hours. The BMW M8 GTE which will feature the same adaptations, is set to compete in the US sportscar classic in 2019.

AUTO+MEDICAL FEATURES



THROTTLE RING
The throttle ring system enables Zanardi to accelerate using his fingers, pulling a ring paddle located on the rear of the steering wheel. The ring can be operated using both hands or either left/right separately, and uses the same sensors at the standard throttle pedal.

STEERING WHEEL
The steering wheel is the same used by Zanardi in GT cars that he has driven in the past, including the throttle ring and buttons that have been adjusted for his guest appearance in DTM.

GEAR SHIFT SYSTEM
Like all other drivers, Zanardi uses a paddle-shift system located to the right side of the steering wheel that enables him to shift up and down through the gears. A separate paddle at the end of the brake lever is also used to downshift through the gears during a braking manoeuvre.

AUTO+MEDICAL FEATURES

CENTRIFUGAL CLUTCH
A standard DTM car uses a hydraulic clutch for the start of the race and pulling away from the pit box during a pit stop, however Zanardi's car uses a fully automatic, centrifugal clutch instead. This automatically operates the clutch at certain engine speeds and is not operated by the driver, with the engine speed pre-determined by BMW engineers as part of their set-up work.

HAND-OPERATED BRAKE SYSTEM
The braking system has been converted to a hand-operated system located in the centre console area. This is the first of its kind, with BMW Motorsport engineering it so the lever itself exerts pressure to the cylinder rather than through the pedal. As a result, the pedal box that houses the usual throttle, brake and clutch array is no longer necessary.

THE ROAD BACK:

ALEXANDER ALBON

During a training accident in June 2017, F2 driver Alexander Albon broke his collarbone in six places, but managed to return to action after missing only one race of the championship. He told AUTO+ Medical about his injuries and swift recovery.

During a routine training session in Woburn Forest, London, Alexander Albon was out on his bike alongside then team mate and now 2019 Williams F1 driver George Russell. The pair were cycling down a trail, when he was suddenly flipped over by a drop in a tree root. Albon landed heavy on his collarbone, breaking it in six places. After missing the Baku Formula 2 round, he returned a few weekends later for the Austria race where he managed a second place podium finish, despite racing with a metal plate inserted and his arm put in a sling.

AUTO+ Medical: How did the accident happen and where did it take place?
Alex Albon: The accident happened during a training session - I was with my trainer, Aleix, and George Russell and it was about a week before Baku. We were biking in Woburn Forest, near to where I lived. I was the first to go down the trail and I was going quite quickly and suddenly I saw there was a tree root and a big drop after. I tripped over the root and my bike flipped over and I landed pretty heavily on my collarbone. I knew straightaway that I broke something!

A+M: What injuries did you sustain?
AA: I broke my collarbone. It was a butterfly fracture in six places.

A+M: What treatment did you receive?
AA: I had to get a metal plate inserted - they said it was the biggest size they had there. Because this happened on Friday evening, I didn't actually get operated on until the following Wednesday, so I had to keep my arm in a sling and tried to minimise any movement to the collarbone. In terms of pain relief, I was given morphine and paracetamol, but the morphine made me feel nauseous and sleepy and so I only took it when I had to, such as when I was travelling to London.

Hintsa Performance helped Albon contact top UK doctors during his recovery

A+M: Were there any doctors/physios that you were working with?
AA: Not really, only my trainer at the time, Aleix.

A+M: Were there any specific exercises or movements that you had to do?
AA: As soon as I had the metal plate inserted, the doctors recommended trying to get movement back as soon as possible, so I went back to training pretty quickly. I did mobility in the swimming pool at the beginning and then we moved to band movements, eventually doing mainly body weight exercises.

A+M: What stopped you from being able to jump back into the car immediately?
AA: The main issue was I finished my surgery on the Wednesday and I had to drive on the Friday. The most painful part when I drove was how the seatbelt would put pressure on the collarbone. So, we decided to not do the race.

Albon's surgeon is the same used by the English Rugby Team

"I WANTED TO RACE AS SOON AS POSSIBLE. I DID TRY TO CONVINCE THE DOCTOR TO CLEAR ME FOR BAKU, BUT HE WOULDN'T BUDGE!"

Albon took his maiden F2 win at Baku this season

A+M: Did you have to change any of your training regime?
AA: We tried to maintain my strength on my left side and so we kept the same training programme for that side. We did quite a lot of isometric exercises, and in terms of getting my flexibility and strength back on my right side it was just trying to increase the movement each day and applying more force. By the end of the week we could start doing things like press ups and TRX exercises.

A+M: Were you eager to return to racing? Or was it more important to get through the recovery first?
AA: I wanted to get back to racing as soon as possible and I did try very hard to convince the doctor to clear me for Baku, but he wouldn't budge!

A+M: How did you feel getting back into the car? Was there anything the team had to do, to make the seating position comfortable?
AA: First thing, it was really important to warm up, especially the muscles around the collarbone. Then for driving I had thick plasters on the wound where the seatbelt would rest to act as padding, we would put layers on and also tape them. My mum also got me some silicone padding but thankfully we didn't need to use it! To be honest, my first round back at Red Bull Ring wasn't too bad at all - I had no pain once the adrenaline came in. I definitely felt it more at Silverstone the week after, as the circuit is a lot bumpier than the others we raced on.

A+M: What advice do you have for drivers who suffer similar injuries?
AA: It seems like it's the end of the world when you have an injury that means you have to miss a race. I was very down after my crash but in the end I gained a lot of will-power to come back stronger than ever, and I came back with a podium. I was very lucky to be with Hintsa Performance who have links to some of the top doctors in the UK. My surgeon is in charge of all the English Rugby team for shoulder/collar bone related injuries. I highly recommend seeing someone like that, as they also understand the importance of getting back to your sport as soon as possible and know the limits to how quick you can return.

A+M: Is there anything else you would like to add?
AA: Racing should only be on a track and not in a forest!

SCIENCE

eFAST IN MOTOR SPORT

The use of Sonographic technology is enabling doctors to medically assess racing drivers more effectively after high-speed crashes. This literature review explores the use of eFAST (extended Focused Assessment with Sonography for Trauma), and its role in the emergency care of competitors in motor sport.

Author: Dr Jean-Luc Baudel (PH) , Resuscitation Doctor, Hospital Saint Antoine

Technology in ultrasound is enabling better medical assements of drivers after high-speed crashes

For nearly 20 years, Focused Assessment with Sonography for Trauma (FAST) has been recognised as a non-invasive diagnostic tool in emergency evaluation of trauma patients [1], as well as in the prehospital environment [2, 3]. Initially, the purpose of this examination was to identify free fluid in the abdominopelvic peritoneum [4, 5] even minimal fluid levels could be identified (figure 1) as well as in the pericardium [1] (figure 2). Subsequently, the extended Focused Assessment with Sonography for Trauma (eFAST) replaced FAST by integrating the search for pneumothorax and hemothorax [6, 7, 8,] (figure 3).

For the FAST (figure 4, blue probes), the abdominal probe is applied on the right upper quadrant, left upper quadrant and pelvis to identify peritoneal effusions. For detecting fluid in the pericardium, the subcostal view of the heart is used. The other alternative views with the cardiac probe are the parasternal long axis view and the apical view of the four cavities (atria and ventricles). The cardiac probe is also used to search for hemothorax or pneumothorax (according to the illustrations with the green probes on figure 4).

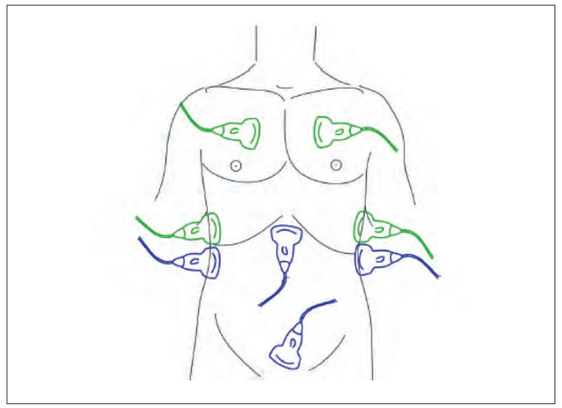


Figure 4 (Weile J 2017)

“WITHOUT HINDERING THE 'SCOOP AND RUN' PROTOCOL, EFAST CAN BE INTEGRATED WITH CLINICAL EXAMINATION”

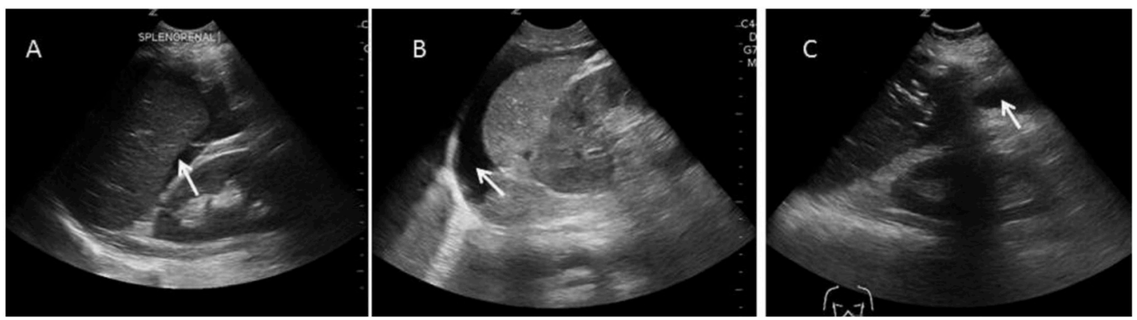


Figure 1 (O’Brien KM, 2015)
A: Effusion in the splenorenal recess
B: Effusion between the diaphragm and the spleen
C: Effusion in the left paracolic gutter inferior to the spleen

Sonography can be used to accurately assess a drivers condition after a crash

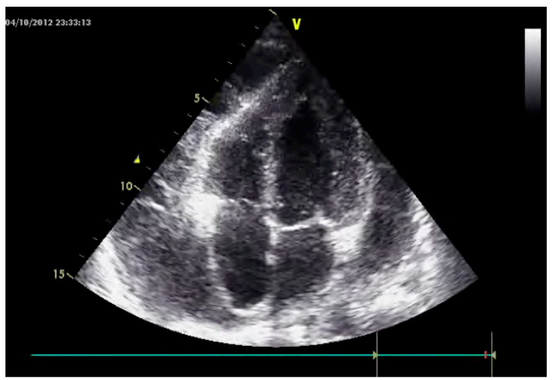


Figure 2 Voluminous pericardial effusion (Baudel JL)

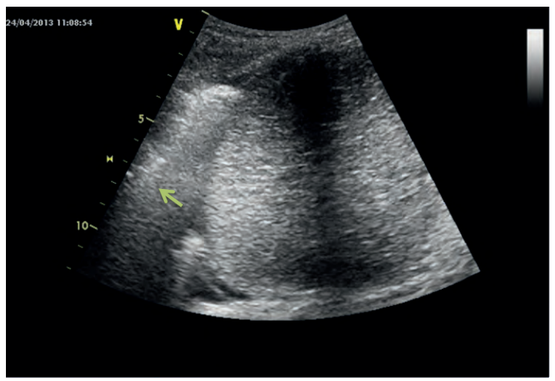


Figure 3 Hemothorax (Baudel JL)

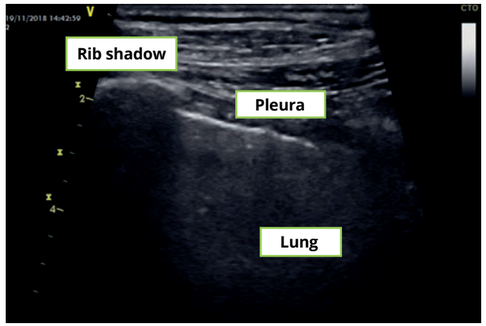


Figure 5 (Baudel JL)

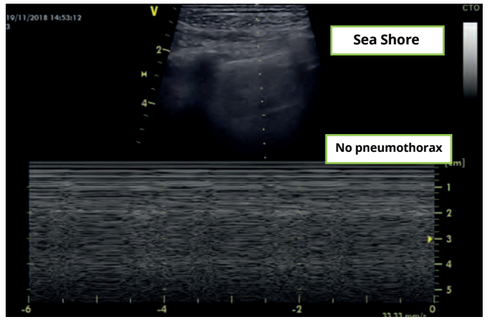


Figure 6 (Baudel JL)

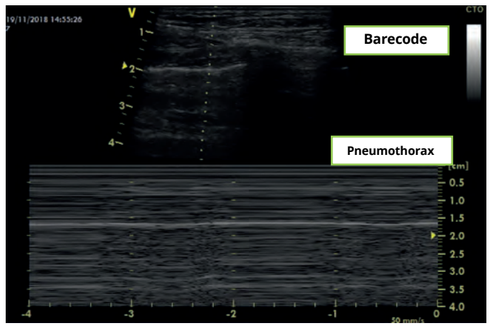


Figure 7 (Baudel JL)

The pneumothorax can be diagnosed in two ways on ultrasound: the first, in 2D mode with loss of visualisation of pleural slip (figure 5) and the second in M mode, recording the movement of the structures encountered by a linear ultrasonic beam over time, with the absence of the distinction between the pleural line ("sea shore") and the lung ("beach") (figure 6). Then the ultrasound findings in this mode with barcode (figure 7) suggest a pneumothorax [9]. However, eFAST can sometimes miss the pneumothorax when it is small at the apex or at the base of the pulmonary field, but most often there is no need in these cases for drainage [10].

In view of this data, the American College of Surgeons recommendations for management of traumatised patients using Advanced Trauma Life Support (ATLS), involves a radiological assessment, comprising eFAST together with X ray and pelvic radiography, and supplemented if necessary by a targeted CT scan [11]. This treatment does not lead to more deaths at 24 hours or 30 days, more blood transfusions (but could even anticipate blood transfusion [12]), more complications, or to an increase in the length of time in intensive care or hospital, compared to treatment with a body scanner immediately, involving less irradiation [13, 14].

The technique of the eFAST is rather easy in its acquisition as well as in its reproducibility [11, 15, 16]. In the USA, it is taught to the medical students from the first cycle of their studies [15]. In addition, advances in technology have led to the emergence of portable scanners (figure 8), with high-resolution imaging at a reasonable cost, enabling, in particular, their use in extra-hospital settings [17].

The Vscan General Electric has a size equivalent to that of a smartphone (figure 9).

Figure 8

Since June 2017, it is even possible to download an application on a smartphone and connect to the ultrasound probe through a USB input (Philips Lumify, figure 10).

WHAT COULD EFAST BRING TO THE MANAGEMENT OF CRASH DRIVERS?

The interest is twofold: first, consider the management of a multi-traumatised competitor. Without hindering the "scoop and run" protocol, eFAST can be integrated with the clinical examination. It is possible to identify and anticipate the therapeutic steps that may be required before transportation, evacuation to hospital, and describe the potential abdominal lesions to the surgeons, allowing for better preparation of the operating room. Emergency intervention may be undertaken on the spot like the drainage of a hemopneumothorax causing a tamponade.

Secondly, eFAST can ensure the absence of occult lesions among competitors following a crash with very high deceleration, who may show no abnormality on clinical examination. This systematic eFAST could be evaluated in a prospective clinical study.

But this eFAST could be completed, afterwards, by a simple echocardiographic examination in search of global disorders of the left ventricle kinetics, of valvular

"TECHNOLOGY ADVANCES HAVE LED TO PORTABLE SCANNERS, WITH HIGH-RESOLUTION IMAGING AT A REASONABLE COST"

insufficiencies like an aortic insufficiency more or less associated with a pericardial effusion, direct signs of post-traumatic aortic disease [18-20].

Transcranial Doppler could also complement eFAST in view of the existence of impaired cerebral autoregulation in patients with concussion [21-22], with the possibility of vasospasm [23] and early after the trauma without significant clinical findings [24].

Thus, the ultrasound examination could not only have a role in the emergency care of competitors in motor sport, but also in the follow-up of those involved in successive crashes with rapid deceleration, where it could be used to identify valvulopathies, systolic-diastolic functional disorders of the left ventricle, and dysregulation of cerebral self-regulation, a similar approach to the follow-up of other sportsmen such as American footballers, hockey players or boxers exposed to multiple concussions and traumatic brain injuries [25-26].

Figure 9

Figure 10

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Every issue of AUTO+ Medical contains a scientific research paper that looks at the various medical issues that surround motor sport.

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For each submission please include a summary of the research and all necessary contact information.

The editorial board will evaluate each submission before it is accepted for use in the magazine.