

circulation is a 'flow' and governed by Ohm's law (Flow=Pressure/Resistance). This can be explained through simulation using an electric circuit, which is also a flow system.

**Case description:** A 62-year old woman visited with hepatic encephalopathy. She had no history of chronic liver disease or liver trauma. Imaging studies revealed an intrahepatic aneurysmal PSS in Couinaud's segment 6, formed between the posterior branch of right portal vein and the right inferior hepatic vein. She was managed by laparoscopic right inferior hepatic vein closure using an autostapling device. Her encephalopathic symptoms improved immediately after the operation, and she was discharged uneventfully. At her 8 month follow-up, she was symptom-free and her PSS disappeared entirely.

**Results and Conclusions:** The basic configuration of splanchnic circulation is essentially two resistors connected in series; the mesenteric vascular resistance and the portal vascular resistance. It is a pressure divider between the aortic pressure and systemic venous pressure. In turn, the portal vascular resistance can be seen as two resistors connected in parallel; the hepatic vascular resistance and the PSS resistance. A PSS means the shunt flow above zero, and according to Ohm's law, there are two ways for the PSS to be formed. In one condition, the portal pressure increases sufficiently high and a PSS begins to form at a fixed shunt resistance. Once the shunt channel is established, portal pressure will decrease until equilibrium is reached between the portal pressure and the shunt flow. A clinical example is liver cirrhosis. In this condition, PSS will persist even if the outflow is occluded. In the other condition, the shunt resistance can decrease at a fixed portal pressure, such as an aneurysmal dilatation of PSS. In this case, PSS will disappear after outflow occlusion, because the shunt flow becomes zero. The puzzling phenomenon of the disappearance of PSS in our case can be easily explained by simulation using an electric circuit theory.

**Take home message:** Blood flow is similar to an electric current and is governed by Ohm's law. By simulating splanchnic blood flow with an electric circuit, we can easily understand the underlying pathophysiology of many seemingly curious phenomena.

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## Standard versus minimally invasive transforaminal lumbar interbody fusion: A prospective randomized study

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**Introduction:** Symptomatic spondylolisthesis patients may benefit from surgical decompression and stabilization. The standard (S) technique is a transforaminal lumbar interbody fusion (TLIF). Newer, minimally invasive (MI) techniques seem to provide similar results with less morbidity. However, prospective studies comparing S versus MI TLIF are rare.

**Case description:** Patients with at least 6 months of symptoms and image-confirmed low-grade spondylolisthesis (grade 1 or 2) were enrolled, at a single academic institution, between 2011 and 2015. The patients were randomized to either S or MI TLIF. Iliac crest graft, polyether ether ketone (PEEK) interbody cages, and pedicle screw-rod constructs were used in both groups. The primary outcome measure was the Oswestry Disability Index (ODI) improvement at 1 year. Secondary outcome measures included

length of operation, estimated blood loss, length of hospitalization, and fusion rates at 1 year. Complications were also recorded.

**Results and Conclusions:** Forty patients were enrolled in each group. There was no crossover between groups. The age was 50.12 +/-11.09 years in the S TLIF group and 51.3 +/-9.36 years in the MI TLIF group. There were 23 and 24 females in the S and MI TLIF group, respectively. The mean operative time and estimated blood loss in the S versus MI TLIF group were 297 +/-101 versus 323 +/-85 minutes and 417 +/-211 versus 351 +/-198 ml, respectively. There were 4 transfusions in the S TLIF and 3 transfusions in the MI TLIF group. The patients were discharged after surgery at 4.12 +/-0.88 days for the S TLIF group and 1.92 +/-0.52 days for the MI TLIF group. The ODI improved from 37 +/-6 to 11 +/-6 in the S TLIF group (ODI difference: 26 +/-7) and from 38 +/-7 to 11 +/-6 in the MI TLIF group (ODI difference: 26 +/-8). The fusion was considered solid (Grade I) in 36 (90%) and partial (Grade II) in 4 (10%) patients at 1 year. There were no reoperations for pseudarthrosis or any other postoperative complication. There were 2 superficial wound infections in the standard TLIF group, which resolved with oral antibiotic treatment alone.

**Take home message:** In this prospective randomized study, the standard and minimally invasive TLIF in patients with symptomatic spondylolisthesis provided similar clinical and radiological outcomes at 1 year. The patients undergoing MI TLIF had a shorter hospital stay. Both surgical techniques yielded good results at 1 year.

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## Augmented reality game related injuries

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**Introduction:** There are an increasing number of reported injuries associated with ambulatory mobile phone use. PokemonGo is one of the first mobile augmented reality games. We present a case of electrical burns in a PokemonGo player.

**Case description:** A young male sustained high voltage electrical burns from falling onto a railway track whilst playing PokemonGo. Injuries involved 7% full thickness burns affecting both lower limbs, chest, right elbow and right maxilla. This was associated with loss of motor function in his right foot. Emergency fasciotomies were performed. He required extensive wound debridement, including a large portion of his extensor mechanism. Rhabdomyolysis was treated with intravenous fluids. Due to extensive loss of anterior thigh muscles and common peroneal nerve damage from the injury, he subsequently had an above knee amputation.

**Results and Conclusions:** Mobile phone use by drivers is widely acknowledged to contribute towards accidents and injuries. Pedestrian mobile use has been identified as having a similar effect on user safety. The rate of increase of pedestrian injuries associated with mobile phone use surpasses that of motor vehicle drivers, although it is anticipated that this remains under-reported. Mobile phone use impacts on situational awareness and causes temporary user distraction. In addition augmented reality games blur the distinction between the physical and computer world, impairing judgement. Recently safety measures targeting distracted pedestrians have been considered. These include education, signs, separated walkways for device users and fines.

**Take home message:** Use of mobile devices impairs situational awareness and co-ordination. Increased awareness and reporting of injuries associated with device use is important in informing the public and healthcare providers. Further measures are required to target this public safety concern.

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