The Weekly Probe

21st April 2017 **Volume 14 Issue 14**

Antibiotic Shortages – there is now a shortage of Tazosin to add to the vancomycin supply problems. Please discuss with the ID staff if this medication is considered for ongoing use. (Timentin and cipro may be other Pseudomonas alternatives)

FAST Ultrasound course – There is a FREE 1 day eFAST / AAA course on Wed 10th May (08:00 – 16:15) at the Clinical Skills Centre, Kensington St, St George Hospital. There are only a few spaces left so please contact Lara.McGirr@svha.org.au ASAP to secure a place.

Needlesticks – please, please be vigilant in disposing of your sharps as if you aren't, it puts others at risk!!

Hand Hygiene – There is a competition promoting Hand Hygiene. We want innovative A3 posters promoting HAND HYGIENE. Make it as colourful as you'd like . ****There will be a prize for the winner as well as the poster being displayed in the department!* Any questions please speak to Lauren, Liz or William S.

THIS WEEK

ROTAVIRUS AND INTUSSUSCEPTION - Addition to last week's case

Last edition we discussed intussusception and a colleague sent some info from the Australian Immunisation website on the relationship of the new vaccine with intussusception. Thanks for the info

The rotavirus vaccine recommended as part of routine childhood immunisation. It is a vaccine of inactivated live rotavirus and given orally at 2 and 4 months of age, or 2, 4 and 6 months of age, depending on the vaccine brand used.

Rotavirus and Intussusception
Evidence has shown there is a slightly increased risk of intussusception, a bowel condition, associated with rotavirus vaccination. The increased risk of intussusception following rotavirus vaccination is estimated as approximately 6 additional cases of intussusception among every 100,000 infants vaccinated, or 14 additional cases per year in Australia ie uncommon yet not unheard of.

Liver Function Tests

An 18yo man presents with sore throat and abnormal LFTs (raised SAP and GGT >> AST + ALT yet normal bilirubin). What could be causing this and other LFT abnormalities?

Caveats –LFTs lack sensitivity – they can be normal with some liver diseases such as cirrhosis – They also lack specificity and can be elevated with other conditions

- Tests of liver's capacity to transport organic anions and detoxify drugs – bilirubin, urobilinogen

- Tests to detect hepatocyte injury – AST, ALT (hepatocellular) , GGT, SAP (canalicular)
- Tests of liver's biosynthetic capacity – albumin , ceruloplasmin , AFP, PT

AST – Found in liver cells (within cytosol & mitochondria), skeletal mm, kidney & brain - Increased levels are found with hepatocellular disease. The AST/ALT ratio is typically >1 in alcoholic liver disease and <1 in non-alcoholic liver disease (One way to remember that ALT elevation is LESS with aLcohol). Although AST levels are increased with cardiac and skeletal muscle disease, more specific tests are available in these situations. Haemolysis during collection or refrigeration of unseparated blood may cause an artefactual increase. Levels don't correlate with outcome.

ALT – Primarily localised to liver- within cytosol. Increased ALT levels are associated with hepatocellular damage. ALT is more specific for hepatocellular damage than is AST or LD and remains elevated for longer, due to its longer half-life. Lack of ALT rise may be related to pyridoxine deficiency. ALT may be slightly elevated in skeletal muscle disease but the degree of elevation is much less than for AST and CK. Levels don't correlate with outcome.

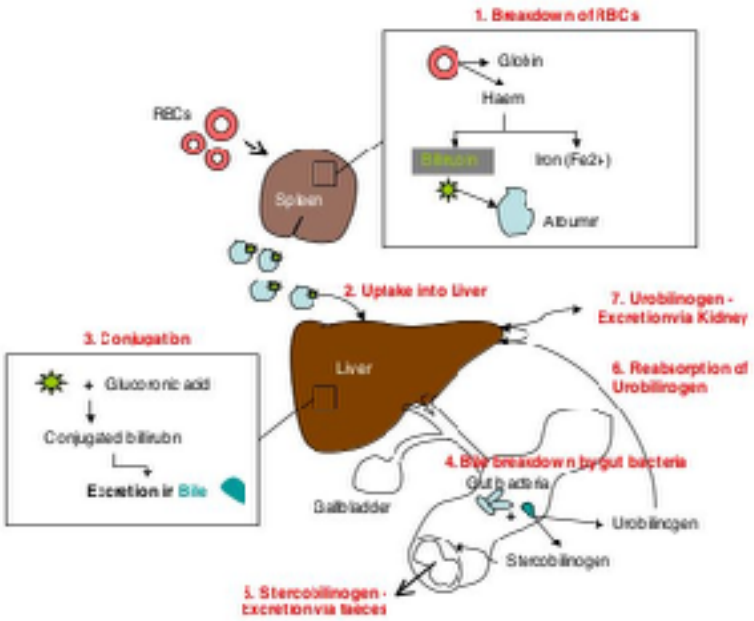
Bilirubin- Bilirubin is produced by the normal breakdown of pigment-containing proteins, especially haemoglobin from old red blood cells and myoglobin from muscle breakdown. Bilirubin released from such sources, tightly albumin bound (not water soluble), is delivered to the liver, where it is efficiently extracted and conjugated by hepatic glucuronidation and sulfation. Conjugated bilirubin is rapidly excreted into bile, metabolised to urobilinogen (or stercobilinogen) and it is then absorbed from the gut (as urobilinogenor) metabolised further/ passed in faeces. Therefore, the amount of conjugated bilirubin present in serum in healthy subjects is trivial (less than 10% of measured total bilirubin). An elevated level of conjugated serum bilirubin implies liver disease. Because only conjugated bilirubin appears in urine, the finding of bilirubinuria also implies liver disease.

Most laboratories report only total bilirubin levels, the sum of the conjugated and unconjugated portions. It is sometimes useful to determine the fraction of total serum bilirubin that is unconjugated versus conjugated, usually referred to as fractionation of bilirubin. To make matters more confusing, the conjugated bilirubin is sometimes referred to as the direct-reacting bilirubin and the unconjugated as the indirect-reacting bilirubin (UNcong =INdirect) - not completely correct though as indirect bilirubin may be an underestimate of the true unconjugated concentration.

The main clinical situation in which this is useful is when all the standard liver test results are normal, except the total bilirubin. Normally, 90% or more of measured serum bilirubin is unconjugated (indirect-reacting). When the total bilirubin level is elevated and fractionation shows that the major portion (90% or more) is unconjugated, liver disease is never the explanation. Instead, the clinical suspicion should turn to one of two explanations. If the patient is young and healthy, an inherited decrease in the inability to conjugate bilirubin is likely- Gilbert's syndrome. It causes no symptoms and is associated with no liver disease. Interestingly, fasting and intercurrent illnesses such as influenza often make the level of unconjugated bilirubin even higher in those with Gilbert's syndrome. This syndrome is diagnosed when all the standard liver test results are normal, and 90% or more of the total bilirubin is unconjugated.

Elevations of the unconjugated bilirubin level, when the conjugated bilirubin level remains normal, may also indicate an increased load of bilirubin caused by haemolysis when the rate of production exceeds the rate of conjugation. Isolated elevation of unconjugated bilirubin occurs. Anaemia and an elevated reticulocyte count are usually present in such cases.

- In inherited disorders of bilirubin conjugation(eg Gilberts), the proportion of conjugated bilirubin is reduced- No other abnormal LFTs; no anaemia; onset in late adolescence; fasting makes bilirubin rise .
- In biliary obstruction or hepatocellular diseases, both conjugated and unconjugated bilirubin accumulate in plasma- may have other abN LFTs.
- In haemolysis, total plasma bili increases, but the proportion of the unconjugated and conjugated fractions remains unchanged- Anaemia seen; increased reticulocyte count; normal LFTs (although LDH may be elevated)



Dx. Yellow skin colour with normal bilirubin may be due to carotenaemia.

GGT- Found in the liver, kidney, intestines and prostate- Increased levels are found in cholestatic liver disease and in hepatocellular disease when there is an element of cholestasis. Levels are increased in diabetes, with chronic intake of excess alcohol and with certain drugs (especially phenytoin) as a result of enzyme induction. Pancreatitis, AMI, prostatitis & drugs such as phenytoin, TCAs, Guillain Barre, anorexia nervosa, hyperthyroidism may also be associated with increased levels. Levels may be normal early in the course of acute hepatocellular damage eg, acute viral hepatitis, paracetamol hepatotoxicity. The GGT level is very sensitive, frequently elevated when no liver disease is apparent. The only usefulness of the GGT test is that it confers liver specificity to an elevated alkaline phosphatase level.

SAP (alk phos) – Found in the bile canaliculi & sinusoidal side of hepatocytes- values high in younger pts, low middle age and higher with older pts - Increased levels in liver disease (particularly in association with cholestasis (intra or extrahepatic)) (hepatitis or EBV may present with a cholestatic picture) (other liver dx such as infiltrative liver Dx, abscesses, granulomatous liver Dx or amyloid) , bone disease (with increased osteoblastic activity eg, Paget's disease), some bony metastases (especially prostate and breast), and at times in malignancy without liver or bone metastases (Regan isoenzyme). May also be elevated in some gastrointestinal diseases or due to a macroenzyme. Marked but transient elevation of ALP may be seen in children, probably attributable to viral infection.

Albumin- Half life ~ 20 days so not an indicator of acute Dx. Liver is only site of synthesis. Decreased levels may be associated with overhydration, chronic liver disease, protein losing disorders (eg, nephrotic syndrome, protein-losing enteropathy), malnutrition, and shifts into the extravascular space (eg, burns).Increased levels may be seen with dehydration. Increases above the true level may occur with excessive use of tourniquet for sample collection, and with some methods that also measure acute phase reactants.

Prothrombin Time – Prognostic indicator. More sensitive than the APTT for the detection of coagulation factor deficiencies due to vitamin K deficiency, liver disease. Screen for deficiency of factor VII and, with APTT, factors X, V, II, I. If PT improves by > 30% post vitamin K within 24 hrs it can be surmised that hypovitamosis was responsible for the prolonged PT eg extra-hepatic obstruction or fat malabsorption. Patients with parenchymal Dx will only show minimal improvment

Urinary urobilinogen – seen with hepatocellular dysfunction- can disappear from the urine in cholestatic jaundice

Ammonia levels - Blood ammonia values are not necessarily elevated in patients with hepatic encephalopathy. Determination of blood ammonia levels is most useful in patients with altered mental status of new onset or unknown origin

Refs – RACP manual / Am Fam Phys Johnston 1999 / Cleveland Clinic website

Editor: Peter Wyllie

SUTURES

A 2 yo boy presents after lacerating his supraorbital region on a coffee table. You close the wound with 6/0 Biosyn (absorbable sutures). The parents are happy that they "won't need to be removed" yet what advice do you give the parents about sutures?

Firstly, why use absorbable sutures? Is the end result equivalent?

Bestbets reviewed this issue finding 4 RCT's which enrolled a total of 433 patients with age range of 1-18 years. Looking at a primary outcome assessed from 3 months to 12 months, absorbable sutures (note they used rapid absorbing catgut sutures) appear to be equivalent to non-absorbable sutures for traumatic facial lacerations repair in children. There is no significant difference in short or long-term wound cosmesis, dehiscence or infection rates and parental/patient satisfaction. Similar results were noted with a RCT published in Academic EM in 2004.

So the cosmetic result is similar yet the advantage of absorbable sutures, as the name implies, is that the sutures will be absorbed and fall out eliminating the need for emotionally "traumatic" suture removal and the logistic hassles.

Luck et al found that when blinded health care providers rated wound outcome photographs from patients with fast absorbing gut vs nylon sutures at 3 months, these providers felt nylon sutures did provide a better cosmetic outcome. However, when parents / carers of the children whose wounds were repaired were asked to rate the scar outcomes, they found no significant difference. Furthermore all the parents in the absorbable suture group said they would want wounds repaired the same way in the future, while only ~ ¾ of the nylon suture group said the same. Note they used the rapidly absorbing gut.

"Absorbable"?

Luck et al also looked at how many days it took for all of the absorbable sutures to completely dissolve (they used rapidly absorbing gut). They found that fast absorbing gut sutures lingered in those wounds for up to 2 weeks.

In general suture hydrolysis depends on the suture composition (materials, mono vrs multifilaments) and the environment they are used. This will also affect the handling of the suture material, the knot security, the tensile strength of the suture, the tissue reaction and the duration of suture integrity.

In the mouth sutures dissolve at ~ double the rate when c/w when used in other tissues. On the skin the buried portion is likely to dissolve, but the exposed skin portion may remain. The problems is that the longer the sutures remain in the wound, the more they will contribute to wound inflammation, stitch abscess formation, and poorer cosmetic outcomes. Therefore they cannot be left in until they fall out unless the time is appropriate for that wound.

What do we use?

Look at the type of suture next time you reach for a packet, yet the most commonly used absorbable suture used in the ED is the Covidien Biosyn.

The table below compares the various suture materials- most importantly compare the fast absorbing surgical gut and the Biosyn.

Table 1: Commonly used absorbable sutures...(courtesy of Elsevier, Bologia J.(2008) DERMATOLOGY, 2nd ed.,Mosby Elsevier)

Suture	Configuration	Tensile strength	Ease of handling	Knot security	Tissue reactivity	Uses
Surgical gut (plain)	Virtually monofilament	Poor at 7-10 days	Fair	Poor	Moderate	Rarely used today in skin
Surgical gut (chromic)	Virtually monofilament	Poor at 7-10 days	Poor	Poor	Less than plain	Skin grafts; surface sutures for mucosa
Surgical gut (fast-absorbing)	Virtually monofilament	50% at 2-5 days	Fair	Poor	Low	Skin grafts; surface sutures
Polyglycolic acid (Dexon®)	Braided	20% at 21 days	Good	Good	Low	
Polyglactin (Vicryl®, Polysorb®)	Braided	75% at 14 days 50% at 21 days	Good	Fair	Low	Subcutaneous closure; vessel ligature
Polydioxanone (PDS II®)	Monofilament	70% at 14 days 50% at 28 days 25% at 42 days	Poor	Poor	Low	Subcutaneous closure (high-tension areas)
Glycolide and trimethylene carbonate (Maxon®)	Monofilament	81% at 14 days 59% at 28 days	Fair	Good	Low	Subcutaneous closure (high-tension areas)
Poliglecaprone 25 (Monocryl®)	Monofilament	50-60% at 7 days	Good	Good	Minimal	When skin wall tissue mobility is essential
Glycomer 631 (Biosyn®)	Monofilament	75% at 14 days 40% at 21 days	Good	Poor	Minimal	Subcutaneous closure (high-tension areas)

Compare the Biosyn to surgical gut sutures

- **Fast-absorbing gut**- produced by pre-heating. This maintains strength for 4-7 days and is of more use in areas of low tension (eg face) or when the wound is well supported by deep sutures. For this reason it is the "suture of choice" when the studies are performed. (May not completely absorb for 14-28 days)

Editor: Peter Wyllie

- **Chromic gut** – Tx with chromium salts to reduce enzyme digestion- maintains strength for 10-21 days – thus better for mucosal closures. (May not completely dissolve for 90 days)
- **Plain gut** - poor strength and high tissue reactivity – not used frequently.

Other commonly available synthetic absorbable sutures are

- **Vicryl** (Polyglactin) less tissue reactive than a gut suture. Similar degradation to chromic gut: it will provide effective wound support for 21 days, but it doesn't dissolve for 90 days- need to be removed from skin.
- **Vicryl Rapide** - gamma irradiated to speed its absorption- effective wound support for 10 days and complete absorption in 42 days. Subsequently the patient needs to be informed about suture removal if they have not "fallen out" within the expected time for that wound. (better for chest , extremities)

Time to suture removal – Considering the above features of each suture material, also note that the timing of suture removal varies with the anatomic site, the patient group (younger heal faster) and the degree of tension. However as a broad guide:

- ●Eyelids – 3-4 days
- ●Neck – 4 days
- ●Face – 4-5 days
- ●Scalp – 7-14 days
- ●Trunk and upper extremities – 7-10 days
- ●Lower extremities – 8 to 10 days

Advise the patient to see their GP for wound review at the lesser end of each time period to consider whether the sutures can be removed and the wound supported by other adjuncts such as steristrips.

Summary - So in summary give the patient / carer / parent advice that depending on the wound type, the sutures may need to be removed rather than giving the patient the false expectation that their sutures will dissolve in to thin air. This is particularly relevant if the Biosyn is being used on the face where sutures should be removed in 4-5 days. Consider fast absorbing gut sutures for low tension areas such as on the face.

Refs - https://lacerationrepair.com/wound-blog/absorbable-sutures/

- Luck RP et al, Cosmetic outcomes of absorbable versus nonabsorbable sutures in pediatric facial lacerations. *Pediatr Emerg Care.* 2008 Mar;24(3):137-42. doi: 10.1097/PEC.0b013e3181666f87.
- Luck R Comparison of cosmetic outcomes of absorbable versus nonabsorbable sutures in pediatric facial lacerations. *Pediatr Emerg Care.* 2013 Jun;29(6):691-5. doi: 10.1097/PEC. 0b013e3182948f26.
- Karounis H, A randomized, controlled trial comparing long-term cosmetic outcomes of traumatic pediatric lacerations repaired with absorbable plain gut versus nonabsorbable nylon sutures. Acad Emerg Med. 2004 Jul;11(7):730-5.

JOKE / QUOTE OF THE WEEK

"There is no cure, Mrs. Llewellin. That's because there's nothing wrong with you."

Please forward any funny and litigious quotes you may hear on the floor (happy to publish names if you want)

THE WEEK AHEAD:

Thursday 27th April	JMO Education, Auditorium – Level 2 Dr Phillip Malouf, Assessing Abdominal Pain	12:00pm to 1:30pm

Editor: Peter Wyllie