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MAX HEALTHCARE
Super Speciality Hospital

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Professional Writings by Medical Practitioners, Max Super Speciality Hospital, Saket

INSIDE

Intensity Modulated Radiotherapy with 4D Gating: A novel approach to reduce cardiac morbidity in left sided breast cancer.

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Breast cancer is the most common cancer in women all over India and accounts for 25% to 31% of all cancers in women in Indian cities. (Source: PBCR 2009 - 2011). Irradiation of the whole breast or chest wall after Breast Conservative Surgery (BCS) or post modified radical mastectomy (MRM) has been a standard treatment since decades. With patients increasingly diagnosed at earlier stages, efforts need to be directed to minimize late chemotherapy and radiation induced cardiac effects in left sided breast cancer. New technologies like Four Dimensional Computed Tomography (4DCT) and respiratory gating continue to refine the target coverage while sparing the adjacent healthy organs like heart and lung.

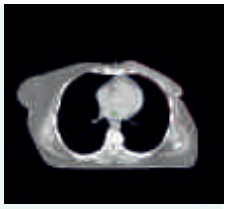

Figure – A

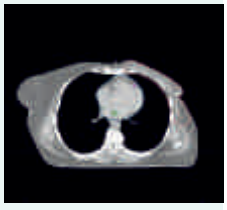

Figure – B

We at Max Cancer Centre adopted Breast gating in 2010. Till now we have treated 67 patients of left sided breast cancer with respiratory gating. For this procedure we take a 4DCT for the patient in coached breathing. The whole respiratory cycle is binned into 10 phases and then the phases are selected for treatment in which the heart is farthest from the chest wall.

Improving Outcomes in Poisoning

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CASE REPORT

69 year old gentleman presented to ED with alleged history of consumption of thirty tablets of Lercanidipine (10 mg each, total dose 300 mg) and 10 tablets of amlodepine (5 mg each, total dose 50 mg) two hours back. There is no history of co ingestion. He is a known hypertensive, was on Lercanidipine. He also has type II diabetes mellitus treated with glimepiride and sitagliptin. Coronary angiography done two months back revealed 40% blockage in proximal left anterior descending artery and is being treated with Ecosprin and Clopidogrel.

MANAGEMENT

The patient was conscious, oriented and anxious on presentation to ED. Vitals were HR-74 /min, BP- 92/54 mm of Hg and respiratory rate of 20/mt. Systemic examination was essentially normal. He was fluid resuscitated and later given 2 gm IV calcium gluconate in ED.

Figure 1. ECG on left shows RBBB pattern

Toxicology profile which included ECG, ABG, CBC, Electrolytes BUN/Creatinine, Glucose, Serum Osmolality, Serum Level and Urine Toxicology Screen was performed. Gastric lavage was done with 70gm charcoal followed by Polyethylene Glycol. He was then shifted to Medical Intensive Care Unit (MICU) for further management.

ICU COURSE

On arrival to MICU patient was anxious with HR -72/min and BP was 78/40 mm of Hg. Mean Arterial Pressure (MAP) was 50mm of Hg after infusion of 2 liters normal saline. Dopamine infusion was initiated to target MAP >60mm Hg. Fluid resuscitation was continued along with vasopressors. Calcium gluconate infusion was initiated at 0.5 gm/hourly as an antidote. 40 units of Insulin along with 50% dextrose and another 40 units of insulin was repeated after 30 min. Dopamine dose was increased and nor adrenaline initiated as shock worsened. Patient was electively intubated and ventilated.

Figure 2. ECG Traces

Patient had sudden bradycardia followed by transient asystole after four hours of ICU admission. Patient was resuscitated as per ACLS protocol. Temporary pacemaker was inserted through CVP line and ROSC was achieved in around 1 minute. Glucagon 5mg IV bolus was followed by infusion @ 3mg/hour. Patient developed oliguric renal failure anuric with ABG showing severe metabolic acidosis and lactate of 7.5. He was given soda bicarbonate 100ml IV bolus and followed by 25ml/hour infusion. Patient continued to be in a state of refractory shock for next 36 hours. Intraaortic balloon pump was initiated.

Fig 3.
Temporary Pacemaker

Fig 4.
Charcoal Haemoperfusion

After 48 hours of ICU admission patient's condition started improving with increase in MAP after around 2 hours of CVVHDF. Urine output was around 50 ml/hour around 6 hour. Another session of charcoal haemoperfusion was given after 4 hours. Vasopressors were progressively weaned off in next 30 hours. CVVHDF was stopped in view of adequate urine output with resolution of metabolic acidosis. Glucagon was continued at 5mg/hour for 48 hours and then stopped. IABP was removed after 62 hours of insertion. Patient was extubated on day 4, shifted to ward on day 6 and discharged on day 7.

Table 1. Serial ABG

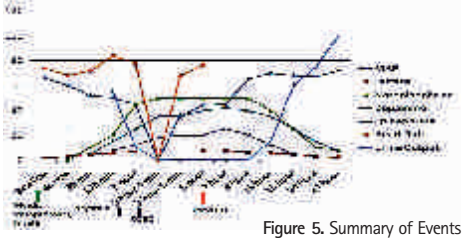

Figure 5. Summary of Events

DISCUSSION

Difficult clinical situations in critical care toxicology often necessitate heroic measures. Advanced critical care toxicology centers need to be developed as early diagnosis and aggressive therapy is required. The vital step in a critically ill toxicology patient is accelerated toxin elimination and organ support. Use of standard ACLS protocols for all patients who are critically poisoned may not result in an optimal outcome. Various methods have traditionally been utilized for enhancing toxin elimination. Extracorporeal toxin removal is one such technique.

TREATMENT PATHWAYS IN CRITICAL CARE TOXICOLOGY

- Decontamination
- Enhanced Elimination
- Antidotal Therapy
- Supportive Care

Figure 6. Treatment pathways ABCDEF of Toxicology

THERAPEUTIC GOALS IN CRITICAL CARE TOXICOLOGY

Initial management of the poisoned patient begins with the ABC's. ACLS algorithms apply in toxicology with only a few exceptions. Once these are stable, begin considering how to minimize bioavailability.

- ABCDE
- Heart rate >60/mt
- Blood pressure > 90 mm Hg in adult
- EF> 50%
- Resolution of acidemia, euglycemia, adequate urine flow (1–2 ml/kg/hour)
- Reversal of cardiac conduction abnormalities QRS<120 milliseconds

SPECIFIC PHARMACOLOGIC THERAPY

Calcium therapy

A reasonable approach to calcium therapy is to give a 0.6-ml/kg bolus of 10% calcium gluconate (0.2 ml/kg 10% calcium chloride) over 5 to 10 minutes. After the bolus, initiate a continuous calcium gluconate infusion at 0.6 to 1.5 ml/kg/hour (0.2–0.5 ml/kg/hour 10%calcium chloride), because bolus administration only briefly increases ionized calcium (5–10 minutes). Serial ionized calcium levels every 30 minutes initially and then every 2 hours with a goal of maintaining ionized calcium.

Hyperinsulinemia / Euglycemia
Flooding the cells with glucose provides an alternate energy source to overcome impaired. Ionotropic effect is seen with calcium channel blocker overdose.

High-dose Insulin
Initial bolus 1.0 U/kg as a bolus followed by infusion 0.5-1.0 U/kg/hr targeting normal glucose levels.

Dextrose
Initial bolus, 25-50 g (1-2 amps D50) followed by infusion, at rate of 0.25-0.5 g/kg/hr with frequent glucose monitoring.

Glucagon
Glucagon reverses bradycardia, conduction blocks and hypotension induced by diltiazem, nifedipine and verapamil. Recommended initial dose of glucagon is 50 to 150 mg/kg. Smaller initial doses frequently fail to produce adequate cardio dynamic responses.

Sodium bicarbonate
Sodium bicarbonate treatment improves hemodynamics. Sodium bicarbonate is the traditional treatment for wide complex QRS conduction abnormalities due to sodium channel antagonism.

Organ support modalities
Poisoning may induce failure in multiple organs, leading to death. Supportive treatments and supplementation of failing organs are usually efficient. Cardiac pacing, mechanical assist devices including IABP & ECMO are utilized in critical care toxicology. ECMO is considered a good salvage therapy for patients who are severely poisoned with ARDS or refractory circulatory shock.

INTRODUCTION TO CRITICAL CARE TOXICOLOGY AT MAX HEALTHCARE:

Institute Of Critical Care Medicine, Max Healthcare is Centre of excellence for Critical Care Toxicology in this part of the world. Advanced critical care toxicology centers need to be developed as early diagnosis and aggressive therapy is required. Toxicology is integral to critical care practice in India and worldwide. There is a steep rise in the number of acute poisoning cases. The urban preponderance of deaths by poisoning reflects the role of life style and stress levels in urban India and is a dangerous trend. The exact incidence of poisoning is not known in India due to lack of central registry but approximately it accounts for 10% of admissions in medical emergency. Toxicology contributes to significant proportion of Intensive Care Unit (ICU) admissions. There is an increasing variety and complexity of toxins. Care of patients with severe poisoning can be enhanced by consultation with a medical toxicologist or regional poison center. Alternative novel approaches should be utilized judiciously. Extra Corporeal Toxin Removal (ECTR) utilizes an extra corporeal system to enhance elimination of toxins.

WHEN SHOULD EXTRACORPOREAL TECHNIQUES BE CONSIDERED?

Poisoning with a drug that is removed by one of the ECTR techniques and severe clinical features or markers of severe toxicity and failure to respond to full supportive care or significantly raised blood concentration for a toxin with good correlation between blood concentration and clinical effect impairment of the normal route of elimination of the compound.

INDICATIONS

ECTR indications are mostly clinical and include refractory shock; clinical deterioration despite multi organ support; altered mental status; and midbrain/brainstem dysfunction resulting in respiratory depression, hypothermia, hypotension or bradycardia. Further indications are evidence of failure of organ systems; impaired endogenous drug clearance due to cardiac, renal, or hepatic failure; and when a drug or poison can be removed more rapidly compared with endogenous elimination.

TOXICOKINETICS IN ECTR

There are various factors influencing drug removal by extracorporeal techniques. We need to consider toxicokinetics and not just pharmacokinetics. The 'ideal' drug kinetics differs for each technique. Mechanism of removal for each technique decides elimination. Extracorporeal intervention is only worthwhile if total body clearance is increased by at least 30%.

MOLECULAR SIZE

It is not just molecular mass, also steric hindrance and polarity which influences elimination.

VOLUME OF DISTRIBUTION

The larger the Vd the less drug is available in the blood compartment for presentation to the extracorporeal device

PROTEIN BINDING

Generally only free drug is cleared, this is particularly important for haemodialysis.

RATE OF ENDOGENOUS CLEARANCE

The contribution of extracorporeal removal is greater for drugs with low endogenous clearance if endogenous clearance is high (> 4ml/kg/min), it is unlikely that further techniques to increase elimination will alter outcome.

RATE OF REDISTRIBUTION

If there is slow redistribution from a secondary compartment, then there is likely to be a rebound increase in concentration of the drug after stopping the technique.

In addition to these parameters, drug removal by haemodialysis is enhanced by high rates of ultrafiltration, high dialysate flow, and a dialyzer with high porosity and a large surface area. The addition of activated charcoal to the Haemoperfusion cartridge increases drug removal. Hemodynamic instability or frank hypotension limits blood flow and drug removal during either extracorporeal procedure.

TECHNIQUES OF ECTR

- Haemodialysis
- Haemoperfusion
- Continuous haemofiltration
- Continuous haemodiafiltration
- CRRT
- Plasma exchange

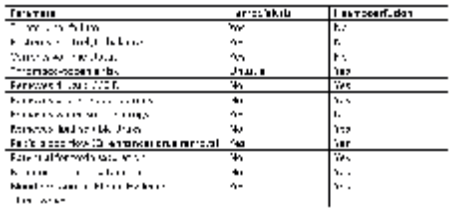

Table 2. Hemodialysis vs Haemoperfusion as ECTR

HEMODIALYSIS

Hemodialysis is generally effective for removing the toxins which are small compounds that are concentrated in the intravascular compartment and are loosely protein bound.

Indications of Hemodialysis as ECTR can be remembered as I - S T U M B LE.

I Isopropanol
S Salicylates
T Theophylline
U Uremic Agents
M Methanol
B Barbiturates
L Lithium
E Ethylene Glycol

HAEMOPERFUSION

Haemoperfusion is an absorptive modality which effectively can clear substances that are lipid-soluble or as much as 95% protein-bound. It provides superior drug clearance and is the preferred modality for extraction of theophylline, barbiturates, organophosphates, and many hypnotics / sedatives / tranquilizers.

CHARCOAL HAEMOPERFUSION

Charcoal Haemoperfusion is preferred for larger, lipid-soluble compounds with greater avidity for plasma proteins. The technique is useful if a toxin is cleared by activated charcoal. This is not limited by plasma protein binding e.g. Oral hypoglycemic agent chlorpropamide. Charcoal

Haemoperfusion is usually performed for 4-6 hours. The cartridge should be changed every 2-3 hours or halfway through the session. The set-up is same as hemodialysis except for cartridge and no dialysate. This may be combined with hemodialysis or ECMO if situation demands.

Indications for Charcoal Haemoperfusion

- Carbamazepine
- Phenobarbitone
- Theophylline
- Meprobomate
- Phenytoin
- Valproate
- Salicylates
- Digoxin
- CCB

PERITONEAL DIALYSIS

Peritoneal dialysis can also be employed as an acute treatment modality for intoxication with water-soluble, small-molecular-weight solutes but has limited clinical utility. It has much poorer drug clearance than haemodialysis and so very rarely used.

PLASMAPHERESIS

This has been used in thyroxine & theophylline overdose.

THERAPEUTIC PLASMA EXCHANGE (TPE)

TPE is warranted when blood purification is required for substances with very high molecular weight and/or high degree of protein binding. Exchange transfusion however can be complicated, rebound increase in drug concentration. There are case reports of TPE in chloral hydrate, iron, theophylline, quinine and methaemoglobinaemia.

CRRT

CRRT is relatively unproven as ECTR technique. It has potential advantages over hemodialysis as it prevents rebound in plasma levels. It may be helpful in clearing toxins with larger volumes of distribution.

CONCLUSIONS

Advanced critical care toxicology Centre equipped with advance organ support and ECTR modalities need to be established The optimal method of extracorporeal removal of many toxic compounds is often a matter of debate. Data largely based on isolated case reports. We have to rely on knowledge of the principles of the methods and kinetics of the drug involved and data from previous reports in which the removal kinetics have been studied before, during and after elimination.

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Post-exposure Prophylaxis In HIV1

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DEFINITION

Medical responses that are initiated to prevent the transmission of HIV to the affected person when exposed to someone with the condition. These may include first aid, counselling, HIV testing and subsequent effective pharmacotherapy along with appropriate support and follow-up.

EXPOSURE MAY BE

1. Occupational - Relating to incidents with healthcare workers, which may include paramedical and medical staff or any other employees of a hospital or healthcare set up who have been exposed to blood and infectious body fluids while performing their daily duties.

2. Non-occupational - Persons who are affected by incidents outside their work places for example, during sexual assaults, in drug abusers or exposure through sexual encounters.

Data for the efficacy for Post Exposure Prophylaxis (PEP) is fairly limited and largely comes from case control studies that have shown a strong inversely proportional outcome between acquisition of HIV infection (following a needle stick injury) and post exposure use of Zidovudine[2]

It should be emphasised that PEP should not be considered to be 100% efficacious and reinforcing the importance of primary prevention strategies to all staff is imperative.

ETHICAL ISSUES SURROUNDING PEP

- Non-discriminatory, sensitive and supportive approach is essential
- Confidentiality - The exposed persons should be reassured that the counselling and testing and prophylaxis are all confidential
- Informed consent- Patient consent is mandatory before initiating any measures to protect the individual

ELIGIBILITY

PEP should be offered only for exposure that has the potential for HIV transmission. Examples include

- Exposure of non-intact skin through sharps injury or skin abrasions
- Exposure of mucous membranes such as splashes to eyes, nose or oral cavity

These exposures have to be with potentially infected body fluids that are from an HIV positive person or those with unknown HIV status.

Body fluids may include - blood, genital secretions, CSF, amniotic, peritoneal and pleural fluids.

FIRST AID

- If the skin is broken the following measures should be adopted:
  - Do not squeeze or rub the injury site
  - Wash the site immediately using soap or mild disinfectant solution such as chlorhexidine gluconate
  - Do not use bleach or iodine as they may irritate the wound and make the injury worse

- After a splash of blood or body fluids, the following are recommended:
  - Wash the area immediately
  - Do not use strong disinfectants
  - If splash occurs contacts the eye, irrigate the exposed eye immediately with water or normal saline. Sit the person on a chair with head tilted back and have a colleague

gently pour water or normal saline over the eye, pulling the eyelids up and down to make sure the eye is thoroughly cleaned

If contact lenses are worn, leave these in place while irrigating the eye, as they form a barrier over the eye and will help protect it. Once cleaned, remove the lenses and clean them in the normal manner.

Do not use soap or disinfectant in the eye.

- After a splash contacts the mouth, the following is recommended:
  - Spit the fluid out immediately
  - Rinse the mouth thoroughly, using water or saline and spit again. Repeat this process several times.
  - Do not use soap or disinfectant in the mouth.

RISK ASSESSMENT

The incident of exposure should be reported to the supervisor or nominated head of the department in order for risk stratification to be done.

TIMING OF PEP

Should be initiated as soon as possible within hours and no later than 72 hours, following exposure. Limited evidence 3, 4 has shown that initiating PEP with in 12, 24, or 36 hours is more effective than initiating it at 48 or 72 hours following exposure.

- Do not give PEP to
  - Previously HIV positive person from a previous exposure
  - In chronic exposure
  - If exposure is not a risk for transmission of HIV
  - Exposure of intact skin to body fluids
  - Exposure to non infectious body fluids - faeces, saliva, urine, sweat
  - Exposure to body fluids from person known to be HIV negative, unless he or she is high risk to have acquired infection recently (and is thus in the window period)
  - If exposure occurred more than 72 hours previously
- PEP services in any hospital or institution should include
  - Identification of such incidents
  - Counselling services for - providing consent, pre and post HIV test counselling, drug adherence and managing side effects and preventing the risk of transmission. Also to provide information to individuals that PEP drugs are safe during pregnancy and may protect the mother from getting HIV infection after exposure and if breastfeeding, PEP drugs are safe
  - HIV testing which includes testing for the person affected and the source person, when possible. Also to note is that this should not be mandatory or a prerequisite to providing PEP drugs. HIV antibody testing is performed and if positive, a second rapid test should be done. Avoid HIV RNA testing by PCR as it has a poor positive predictive value. Depending upon the nature of the exposure, Hepatitis B and Hepatitis C testing may be done
  - Providing PEP medication the initial dose within 72 hours and the full course for 28 days
  - Support and follow up - Follow-up HIV testing at 3 and 6 months. Medications to manage side effects - Nausea, Diarrhoea and Headache, Hepatitis B and C testing, Pregnancy testing at baseline and follow up (for all women of child bearing age)
  - Proper reporting mechanisms and audit mechanisms in place to monitor effects of PEP

GUIDANCE ON PRESCRIBING PEP MEDICINE

There are two guidelines which have been published – one from the WHO and the other, CDC (US) guidelines.

WHO GUIDELINES

Two types of regimes are advised

- Combination of two nucleoside-analogue reverse-transcriptase inhibitors (NNRTis)
- Three drug regimen - two NNRTi + a boosted Protease inhibitor (Pi) where antiretroviral therapy resistance is known or suspected. Both regimens are given for 28 days. No prospective data exists for efficacy between the two regimens as of yet.

CRITERIA FOR RECOMMENDING A TWO DRUG REGIMEN INCLUDES

- HIV status of the source person is unknown
- The background prevalence of resistance to antiretroviral therapy in the community is less than 15%
- The source person has never used antiretroviral therapy
- The source person if unlikely to have HIV infection resistant to antiretroviral therapy, based on antiretroviral therapy and adherence history.

Recommended two drug regimen is Zidovudine + Lamivudine

Alternatives are Tenofovir + Lamivudine or Stavudine + Lamivudine

CRITERIA FOR RECOMMENDING THREE DRUG REGIMEN INCLUDES

- Source person is HIV Positive, taking antiretroviral therapy and is known to have signs of, personal history of or proven antiretroviral therapy resistance
- The source person's HIV status is unknown
- The background prevalence of resistance to antiretroviral therapy in the community exceeds 15% (where this is known)

Recommended three drug regimen is Zidovudine + Lamivudine plus Lopinavir with a ritonavir boost

Alternatives are

- Zidovudine + lamivudine plus Atazanavir with a ritonavir boost OR Saquinavir with a ritonavir boost OR fos- amprenavir with a ritonavir boost
- Tenofovir + lamivudine plus Atazanavir with a ritonavir boost OR Saquinavir with a ritonavir boost OR fos-amprenavir with a ritonavir boost
- Stavudine + Lamivudine plus Atazanavir with a ritonavir boost OR Saquinavir with ritonavir boost OR fos-amprenavir with a ritonavir boost

For pregnant women,

- Avoid Efavirenz and the combination of didanosine + Stavudine or Tenofovir + Emtricitabine

CDC GUIDELINES (2013)[5]

The updated (2013) guidelines recommended preferred drug regimen is

Raltegravir 400 mg PO twice daily + Truvada [combination of Tenofovir 300mg + Emtricitabine 200mg] 1 PO once daily

ALTERNATIVE REGIMENS

(May combine 1 drug or drug pair from the left column with 1 pair of nucleoside/nucleotide reverse-transcriptase inhibitors from the right column; prescribers unfamiliar with these agents/regimens should consult physicians familiar with the agents and their toxicities)[ab]

Raltegravir Darunavir + ritonavir Etravirine Rilpivirine Atazanavir + ritonavir Lopinavir/ritonavir	Tenofovir DF + emtricitabine Tenofovir DF + lamivudine Zidovudine + lamivudine Zidovudine + emtricitabine

The following alternative is a complete fixed-dose combination regimen, and no additional antiretrovirals are needed:
Stribild (elvitegravir, cobicistat, tenofovir DF, emtricitabine)

ALTERNATIVE ANTIRETROVIRAL AGENTS FOR USE AS PEP ONLY WITH EXPERT CONSULTATION

Abacavir
Efavirenz
Enfuvirtide
Fosamprenavir
Maraviroc
Saquinavir
Stavudine

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ECMO in Cardiorespiratory Failure: A New Lease of Life

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Extracorporeal Membrane Oxygenation (ECMO) is a rescue therapy for critically ill patients with reversible cardio-respiratory pathology and those who have probability of death around 80% despite maximal conventional treatment. This gave a new lease of life to many patients those who would have otherwise died from their life threatening disease.

We supported 13 patients on ECMO and it was only considered once the conventional therapy deemed failing. These patients were suffering from different diseases like viral myocarditis, septicemia, ventricular arrhythmia causing heart failure and viral or bacterial pneumonia, Wagener's Granulomatosis leading to ARDS causing severe respiratory failure. In 72% of patients we could successfully separate ECMO, two new patients are on ECMO at present and doing well. We have retrieval facility which means ECMO can be put in another hospital by our team and then shift the patient to our hospital, for those who are too sick to shift on ventilator. Max Hospital, Saket did the first successful retrieval of ECMO in India. We did a Lobectomy on ECMO, a very few cases mentioned inmedical literature. In conclusion ECMO is salvage therapy in patients with life threatening refractory circulatory shock or severe ARDS.

Tuberculosis of The Spine – What's New?

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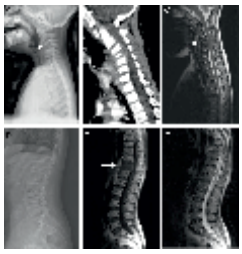
TB of the spine has been an affliction of mankind since ancient times. Over the decades, the disease has evolved and its treatment too has to keep pace with the changing pattern of tuberculosis of the spine. It continues to be a mirror of the social and sanitary conditions of our times. The advent of chemotherapy, improvements in living standards have made the disease an exotic illness in much of the western hemisphere. There this has been possible despite the coming of HIV, drug abuse, and cross border immigration of migrants hailing from places where TB is endemic.

TB continues to thrive in our country and WHO estimates that every 5th person worldwide with TB lives in India. There are 2 deaths every 3 minutes from the disease. Though well known to thrive in poverty, ignorance and neglect, today the disease afflicts all strata of society. Spinal involvement is seen in less than 1% of all cases of TB. The disease of the spine continues to be the commonest form of skeletal TB and the most dangerous. The incidence of neurological complications varies from 10% to 43%. TB affects the spine by haematological seeding from the respiratory, genitourinary and the gastrointestinal tracts. Contributory co-morbidities are diabetes, alcoholism, chronic renal failure, malignancy and a depressed immune system. The thoracic spine is the commonly involved part of the spine. The paradiscal pattern of involvement of the spine is well known; less commonly seen is disease in the posterior elements of the spine, epidural abscesses, subdural granulomas and intramedullary tuberculomas. A cold abscess may at times be the only finding. It is an escape route for pus which would otherwise have caused cord compression and paraplegia. MRI scans help in the early detection of the disease and demonstrate skip lesions, multi vertebral involvement, the presence of an epidural or intradural lesion. CT scans show bony architecture and destruction. They help in obtaining a biopsy. The need for a tissue sample is high as it gives histological proof of the illness, as well as allowing culture and sensitivity. PCR based tests have the

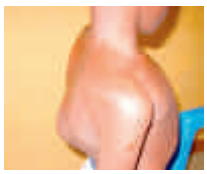
advantage of speed when compared to slower culture methods. In contrast to culture only 1 to 2 days are needed. The technique is based on the presence of genetic material, chromosomal DNA or ribosomal RNA of Mycobacteria. These are detected using the appropriate primer. The combination or binding of the primer to the appropriate genetic material produces sequences typical for MTB or MTB complex. Egg based culture media such as Lowenstein Jensen take 6 to 8 weeks for the appearance of visible colonies, typically described as rough, tough and buff! Colony characteristics and their purity are best discerned by culture on solid media. Due to the time taken, agar based liquid medium such as Middlebrook 7H12 are used. The advantage of liquid media is its yield of growth is faster than the solid media above. The yield is more and is seen as granules or as turbidity. These are employed in automated culture systems such as BACTEC960n mycobacterial growth indicator tube (MGIT) systems- this is based on the fluorescence detection technique. When CO_2 and metabolic end products are released by the bacteria, a change in the pH occurs; it changes the fluorescence of the fluorescent dye in the MGIT tube. This is detected by the fluorescence sensors of the machine. Other systems in vogue are BACTEC460 (uses its own unique culture media in which 14 C carbon labeled CO_2 is released and which is detected by the radiosensors on BACTEC 460) or ESP (Extra Sensing Power) Myco-ESP culture System II (Versatrek) or BacT/ALERT MB Susceptibility Kit Using Middlebrook 7H12 media. The importance of culture and drug sensitivity in the presence of MDR TB cannot be underestimated.

MDR TB in India of primary origin varies from 0.5% to 3%, while acquired MDR TB due to irregular treatment is 6%.The latter is clearly a man made problem and is preventable. MDR TB may be suspected by the continuous involvement of two to four contiguous vertebrae or by the finding of infection in different vertebrae in different parts of the spine. It can be recognised by the lack of clinical improvement, lack of radiologic improvement and the development of a new lesion, the appearance of a cold abscess or increased bone destruction while on treatment in 3 to 5 months. The treatment of MDT TB of the spine is early surgery to stabilise the spine, and reduce the bacterial load. 5 drug chemotherapy is started in the initial intensive phase of 6 to 9 months; 4 drug chemotherapy is given in the continuation phase of 20 to 24 months. Adverse drug reactions are to be expected and it is wise to involve a physician in the medical management. Equally important is the need to improve the general condition of the patient with a nutritious diet and the patient has to take rest.

Modern medical treatment begins in the absence of a neurologic deficit and in the absence of spinal instability. An extended indication is the presence of those co morbidities that render surgery impossible. It would be incorrect to say that all cases of TB of the spine need surgery. However even if a neurologic deficit is absent, but the patient has a large cold abscess, or a large amount of destruction in the spine, severe, constant pain, or does not show response to ATT, surgery should be considered. Again the presence of kyphosis of 40 degrees or more warrants surgery. A neurologic deficit is an indication for surgery. Modern medical treatment is effective when begun early and hence the importance of MRI scanning in patients with severe back pain, becoming worse on movements. The classical picture of fever, night sweats and weight loss is often not seen. Pain is however present in up to 95% of patients with TB spine. Medical management consists of 4 drug (Rifampicin, INH, Pyrazinamide and Ethambutol) chemotherapy for the initial 2 to 3 months and then two drug (Rifampicin and INH) for 12 to 18 months. MRI scans are repeated, if patient continues to be symptomatic. A nutritious diet has to be enforced, along with bed rest. Signs of healing are the patient reporting a reduction in pain, return of appetite, reversal or improvement of any neurologic deficit, and a sense of well being commencing at 4 to 6 weeks after starting treatment. There is a corresponding reduction in the ESR and in the c- reactive protein levels. When the patient is mobilised he should use a TLSO. The reasons for rest in bed and TLSO is to give the body time to overcome a systemic illness as well as to minimize the kyphosis that is invariable.



The average increase in kyphosis is approx. 15 to 30 degrees when treated non operatively, but a deformity of 60 degrees will develop in 3 to 5 % of patients. The degree of kyphosis is influenced by the level of the lesion or disease, the age of the patient, the number of vertebrae that are involved. The problem of kyphosis is particularly severe in children when the spine is more cartilaginous. Kyphosis progresses in a child below the age of 10 years and when 3 or more vertebrae are involved. It occurs in two phases - one, during the stage when the disease is active and second, after the disease has healed. Kyphosis that is seen after the disease heals carries a worse prognosis. The only solution is early surgery done both front and back in the child and careful follow up till skeletal maturity. Kyphosis that is left untreated results is a severe deformity in adult life with an internal gibbus. The cord is stretched over this and the result is atrophy of the cord and myelomalacia. Surgery in this group of patients is hazardous and carries with it the risk of neurologic deterioration. Vertebral column resection done by the posterior approach, with a long pedicle screw rod construct may work.



In the case of multiple level vertebral disease, the general condition of the patient has to be improved before considering any surgery. In such patients when surgery is performed it is anterior debridement and stabilisation with a tibia or a fibula strut graft and fixation from behind.

In general, when surgery is performed in TB of the spine it must decompress the spinal cord, stabilise the spine maintaining its saggital and coronal plane alignment, and promote sound bony fusion in a position that will not permit a late kyphotic deformity. Surgery must of course be accompanied by ATT and by measures to improve the general condition of the patient. Depending on the age of the patient, the level of the disease, the experience and facilities available the operation may be performed by an anterior trans thoracic, trans diaphragmmatic, retroperitoneal route, a posterior route, anterolateral or posterolateral approaches. The principles of surgery in TB of the spine stay inviolate - distraction of the spinal cord should not occur, preservation of as many motion segments as possible is followed, maintenance of saggital plane alignment is a must, and the restoration of the anterior column is needed to prevent deformity.

Some of the newer developments in surgery for TB of the spine are the techniques of biopsy done percutaneusly using CT guidance, or drainage of cold abscesses using a similar method. Thoracoscopy has led to less morbidity when a thoracic abscess has to be drained. It also permits anterior corpectomy, insertion of bone graft or a cage as well as fixation of the spine from the front. Abscesses can be drained using minimally invasive spine surgical (MISS) techniques. Since the trauma of an operation is minimised, faster recovery, and earlier mobilisaton is possible. Spine stabilisation is possible by percutaneus instrumentation. Advances in anaesthesia, ICU care have made spine surgery safer.

TB of the spine has evolved from being a disease that could be treated by chemotherapy alone to one that is now often resistant to the drugs used in standard chemotherapy; treatment now means preventing neurological deficit or treating a neurologic deficit; at the same time it also means preventing or correcting a kyphotic deformity. The treatment of deformity in later life after the disease has healed carries its own risks.

Sedation For Children Undergoing Procedures

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Children today enter the hospital environment for a variety of diagnostic and therapeutic procedures. There is now widespread concern, parental awareness, and ethical imperative among doctors to recognize and treat pain and anxiety in children as they enter this fearful environment. Several of these procedures required the use of general anesthesia and the operating theatre in the past. The use of sedation and analgesia (relief of pain) during these procedures is known as procedural sedation. This has facilitated the performance of a variety of dental, endoscopic, minor surgical, radiologic, and emergency procedures outside the operating room. This has obvious logistical and economic advantages to both the children and hospitals.

Procedural sedation and analgesia involves the use of drugs to reduce anxiety, relieve pain, provide comfort and facilitate the procedure smoothly. This is especially indicated for children who cannot co-operate due to physical, mental or medical disability; where the procedure requires the child to be very still for example, MRI scanning or lumbar puncture; where the procedure is deep and painful as in bone marrow aspiration, tissue biopsies, burn dressings, and fracture reduction; where local anesthesia may be insufficient to control the pain for example, wound repair and dental procedures; whenever the child is excessively fearful, anxious, or uncommunicative; or when the physician anticipates that there are significant medical risks or risk of injuring the developing mind if the child remained awake during the procedure.

Providing procedural sedation involves a specific skillset and equipment managed by a trained physician, usually a pediatric intensivist- a doctor trained in pediatric intensive care or with anesthesia training . At Max Healthcare, all such sedation procedures are managed by a pediatric intensivist. The doctor is usually informed about the procedure in advance. Then he completes a formal assessment of the child before the procedure taking into account such factors as the location and type of procedure, whether it is painful, and the duration of the procedure itself. He may also recommend fasting time before the procedure to prevent aspiration: generally a fasting time of 4-6 hours is recommended depending on the age of the child and type of diet he is on. Infants are generally not kept fasting more than 3-4 hours especially if they are only breastfed. Advance planning and preparation are crucial to ensure comfort and safety of the child throughout the procedure. A presedation assessment is completed including the medical history of the child, medications, allergies, coexistent diseases, and a brief examination to detect major organ system disease, airway stability and patency, and adequacy of breathing. Severe comorbid conditions and organ system damage are contraindications to procedural sedation, and are usually recommended general anesthesia as it is safer. Children suffering from a recent or active upper respiratory tract infection are also refused sedation as the airway is unstable and may compromise cardiorespiratory function during the procedure. An informed consent from the parents is required for all sedation procedures, and the risks and benefits of sedation are discussed on an individual basis.

Sedation is provided on site in the emergency room, radiology suite, endoscopy suite, and various bedside locations in the wards. Monitoring equipment, emergency carts, resuscitation trolleys, and oxygen and suction apparatus are mandatory during all these procedures. Intravenous access is required in all cases. A variety of drugs are used as per the clinical needs: analgesics like fentanyl, sedative-hypnotics like midazolam, anesthetics like propofol and ketamine. Painless procedures are easily performed under midazolam or propofol regimens. Painful procedures are facilitated by ketamine and opioids. The dose and duration are dictated by established protocols and the intensivist monitors vital signs and depth of sedation throughout the procedure.

At the end of the procedure, the child is observed for periods ranging between 1-2 hours depending on the agents used. The child is discharged once baseline consciousness has returned, and has tolerated oral fluids, and the parents can recognize danger signs like apnea, cyanosis, vomiting, and limpness. Documentation of all these stages is completed by the time of discharge. Periodic collation of data and audit help to identify adverse events like deepening level of sedation, requirement of prolonged monitoring or anesthesia, failed sedation, and need for resuscitation.

Written protocols and enhanced training both have diminished the incidence of these adverse events.

As expertise and technology improve, it is anticipated that a far larger number of procedures can be performed safely outside the operating room. Procedural sedation has facilitated the performance of procedures on children smoothly and with minimum discomfort and greater parent satisfaction. Hospitals will benefit from logistical advantages of pooled resources like doctors, equipment, and drug handling to handle the increased caseload of such procedures.

Autism Spectrum Disorder – A Case Study

Dr. Alakananda Banerjee[a], Dr. Hitesh Gupta[b]

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A 4 year's old male child diagnosed with Autism Spectrum Disorder (ASD) was referred for Occupational Therapy on 19th September 2011 at Department of Physiotherapy and Rehabilitation at Max Healthcare, Saket, New Delhi.

Parents were concerned as the child did not speak, did not sit at one place, did not follow commands, avoided eye contact and did not show interest in social interaction.

BACKGROUND

Autism Spectrum Disorders (ASD) is a group of disorders that affects how a person communicates and relates to other people. It is often described interchangeably with the broad spectrum of developmental disorders affecting young children. ASD affects people in all countries and of all cultures, with significantly varied levels of awareness, knowledge and treatment. It has been our experience that parent of an ASD child may not know where to go, who to approach may be misguided which delays therapy and worsens the condition. This alerts us for the increasing need of awareness among people and the health care professionals. Although there are many ongoing projects to ensure that children with ASD are identified early and referred for services, there is need for more work to be done in this regard[1].

A late referral to corrective action also contributes to parental anxiety and places unneeded stress on family. Equally important is a correct referral to a particular therapeutic program with an understanding of the child's condition with particular signs and symptoms, to enable the most effective intervention as the disorders of the spectrum vary in their features. As here in this case, occupational therapy was the prime requirement to manage the features of ASD which made the child eligible for the programs like speech therapy and special education. A delay in intervention may lead to ASD related co-morbidities including behavioral problems, sensory processing disorders, mood disorders, mental retardation, anxiety disorders etc [2].

Dealing with ASD, requires a collaborative care approach wherein the General/Pediatric Physician, Occupational Therapists, Speech Therapist, Special Educators, Psychological Counselors, work holistically together to diagnose the actual problem areas and thus work towards the intervention.

PREVELANCE OF AUTISM SPECTRUM DISORDER

So far, there has not been any epidemiological study of ASD conducted in India. Worldwide studies indicate that at least 1 child in every 150 newborns has an ASD. This makes autism the third most common developmental disorder, affecting upwards of fifty lakh's of people in India, more common than down's syndrome, spina bifida, or cancer in pediatric populations. This suggests that there are approximately 4 million individuals with Autism Spectrum Disorder in India[4]. The majority of children with autism in India have not received a diagnosis or any intervention.

Data suggests that Attention Deficit Hyperactive Disorder (ADHD) and Sensory Processing Disorder (SPD) share high co-morbidity rates with ASD; to be precise, they have a rate of 30-80% and 42-88% respectively [5].

CASE REPORT

History

The subject is a male child. a full-term baby delivered with no complications reported during delivery. His mother reports that as a baby and toddler, he was healthy and his motor development was within normal limits for major milestones development like sitting, standing, walking. His communication development was delayed; he began vocalization at around 3-4 months of age but had developed no words by 4 years. He has been attending play school with a thought that it may benefit him. No other therapy was being given. He was only on medications like (Risdone and Asperito) since a year.

On Observation

- Self engaged all the time
- Increased level of activity
- No command following
- No social smile
- Rare eye contact
- Makes grinning sounds
- Speech age un-appropriate (he only speaks 1 to 10 counting)
- Attention span of 1-2 minutes hardly on an activity.
- Easily frustrated with aggressive behavior

These basic difficulties pervaded every aspect of his development and his family attempts to care for him. It interfered with the child's normal learning processes and development of communication skills.

On Evaluation

Identifying the areas of problems and accordingly setting the interventional goal was the prime focus. Childhood Autistic Rating Scale (CARS) was used on the first day to confirm the diagnosis and see the severity of the autistic features [6]. The child also showed some features of sensory dysfunctions; so a "sensory profile" [7] was administered to rule out the areas of impairment.

Since he also showed hyperactivity, the Diagnostic Statistical Manual IV Criteria for ADHD (DSM IV Criteria) [8] was used along with a 'ADHD behavior checklist' [9] to know the severity of hyperactivity and thus accordingly plan the interventional programme.

Clinical Findings

- CARS: He scored 30 on CARS which falls into the 'borderline autistic' category.
- SENSORY PROFILE: Hypo-responsiveness was seen in all the areas including vestibular and proprioception.
- DSM IV CRITERIA FOR ADHD: Both 'Inattentive' and 'Hyperactive-Impulsive' features was seen, thus being a 'Combined type of ADHD'.
- ADHD BEHAVIOR CHECKLIST: A score of 47 on the checklist suggested major ADHD.

Short term goals

- To increase the attention span
- To improve eye contact
- To build up command following
- To encourage appropriate behavior

Interventional strategies

As per the assessment, intervention was planned which includes 'Sensory Integration (SI)' and 'Behavior Therapy (BT)'. Besides these, parent education was done which included a home program, and making the family aware of necessary environmental modifications and safety precautions.

Sensory integration

Sensory Integration (SI) Therapy is defined as processes through which the brain receives, registers, and organizes sensory input for use in generating the body's adaptive response [10]. Unlike normal kids, children with SI dysfunctions are unable to perceive the body, people and objects because the brain fails to organize the sensory information into meaningful forms and relationships leading to delay in developing skills. Stimulatory activities for tactile,

propioceptive and vestibular inputs were given to the child as depicted in Figure 1, 2, 3 and 4.

SI Therapy provides an opportunity for the child to participate in play that helps the brain to organize the sensory information.

Fig 1. Child in bubble bath

Fig 2. Wedging technique

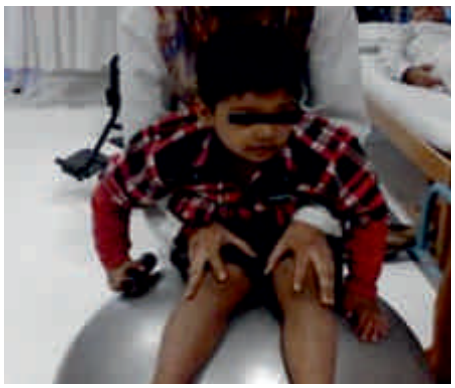

Fig 3. Bouncing on Swiss Ball

Fig 4. Jumping on a Trampoline

BEHAVIOR THERAPY (BT)

BT involves adjusting the environment to promote more successful social interactions leading children to behave in socially appropriate ways. Activities that seem to interest the child were used to ensure participation in play activities.

Few of the techniques include[11]:

- Reinforcements: Reward system that indicates a positive reinforcement
- Prompts: Repeated instructions to stop the child from maladaptive behaviors like giving a firm command "STOP" when the child jumps excessively. At the same time, the child was directed to another activity what will not allow him to continue the repetitive movement and annoying behaviors.
- Imitation: Encouragement of Imitation of behaviors, words and expressions
- Communication and Commands: Very simple, direct and statements avoiding confusions

All these techniques were used while dealing with the child during the sessions. Child was engaged in purposeful activities to build up the attention span, eye hand coordination as shown in Figure 5, 6, 7 and 8. His energy was utilized in group playing, treadmill and other activities as shown in Figure 9 and 10.

Fig 5. Putting corresponding beads in the sticks

Fig 6. Concentrating on size concept

Fig 7. Learning to copy alphabets.

Fig 8. Developing fine motor skills.

Fig 9. Walking on beam.

Fig 10. Walking on treadmill

PARENT THERAPY

The parents were explained the need of the therapy, its benefits and their role in the treatment program. They were educated regarding techniques of using SI and BT in a home based setup. This included:

Home Program

- Scheduling: Setting a same routine every day, from wake up time to bed time.
- Organizing: Organizing each tasks that the child does, encouraging to follow the daily routine.

- Approaching Child: Ways to approach the child and deal with maladaptive behaviors.
- Home Based Therapy: ways to use Sensory Integration and Behavior Therapy at home.

Environmental Modifications

- Assign an isolated area for working of the child.
- Well lit and well ventilated room.
- Clutter free, non-distractible environment.
- Lightings should be soothing; this helps to calm the child.
- No undesirable sounds should be present in the room.

Safety Precautions[12]

- Choose sturdy furniture: furniture that is stable, heavy so that it is difficult to move, not made of glass
- Organize toys
- Secure the rooms: keep bed away from windows, heavy materials and book cases should be out of reach of the child
- Secure the kitchen and bathrooms: keep matchsticks or lighters inside lockers, keep the burners off.

Three sessions in a week were planned in our department which took around one hour each. Rapport with the client took some time. Initially it was difficult to get him involved in activities, but in around 10 days of starting the therapy program, he could sit and do activities for around 10-15 minutes. Starting a new task took around 2-3 days as he never even looked at it. But gradually, once he learnt the task he could do it easily. The therapy sessions continued thrice a week as planned.

Reassessment: After six weeks on 2nd November 2011 re-assessment was done.

Goals Achieved

- Increased attention span
- Improved concentration
- Proper eye contact with social smile
- Improved Command following

Clinical Findings

- CHILDHOOD AUTISTIC RATING SCALE (CARS): The child scored 24.5 on CARS which falls in the "Non-Autistic Category".
- SENSORY PROFILE: On administering the sensory profile, he was still found to be hypo responsive to stimuli but to a less severe degree.
- DSM IV CRITERIA FOR ADHD: The DSM IV criterion was still the same.
- ADHD Behavior Checklist: The score had reduced from a score of 47 to 41.

CHILDHOOD AUTISTIC RATING SCALE

SECTION	CATEGORY	19 Sept	2-Nov
I	Relating to people	2	2
II	Imitation	2	3.5
III	Emotional Response	2	1
IV	Body Use	2	1
V	Object Use	2	1
VI	Adaptation to Change	1.5	1.5
VII	Visual Response	2	1.5
VIII	Listening Response	2	2
IX	Taste, Smell and Touch	2	1.5
X	Fear or nervousness	2	1
XI	Verbal Communication	2.5	2.5
XII	Non-Verbal Communication	2	1
XIII	Activity Level	2	2
XIV	Level and consistency of intellectual Response	2	1
XV	General Impressions	2	2
	TOTAL	30	24.5

A follow up review was also done with their pediatrician.

FURTHER GOAL PLAN

As the child has developed the ability to follow commands, to sit at one place and also does not show extremes of hyperactivity as before, programs like Speech Therapy and Special education focusing towards concept development as well as improving self care skills will now be of great help. Continuation of Occupational Therapy and periodic reviews by the developmental pediatrician is recommended. What is important is to have a futuristic goal planning along with a collaborative approach.

DISCUSSION

Research proves that the earlier an accurate diagnosis is made, the better it is for the child, the family and those around them. Effective strategies can only be employed if the true nature of a condition is known. Although the characteristics of autism are generally evident in the first few years of life, the condition can go undetected or misdiagnosed for many years (most commonly ADHD, behavior problems and poor social and interpersonal skills). Without accurate early diagnosis and most importantly identification of ASD related co-morbidities, these children can be condemned to a life of inadequate provision, their special needs not tackled and their future lives devalued.

Although autism is not curable, its symptoms can be addressed with appropriate interventions and many children with autism can be educated and integrated into community life. Evidences show that a child's brain is most capable of change and adaptation in the first years of life, so interventions to improve the intellectual, social and emotional abilities of autistic children need to be employed as early as possible [4]

CONCLUSION

The diagnosis with a proper interventional approach including occupational therapy makes it easier for people concerning this disorder to move forward, develop essential skills and to live a normal life. Apart from delivery of appropriate interventional strategies to the child, it also enables provisions for family supports and reduction of family stress. Since all autistic children become autistic adults, an investment in early diagnosis and intervention is an investment in the futures.

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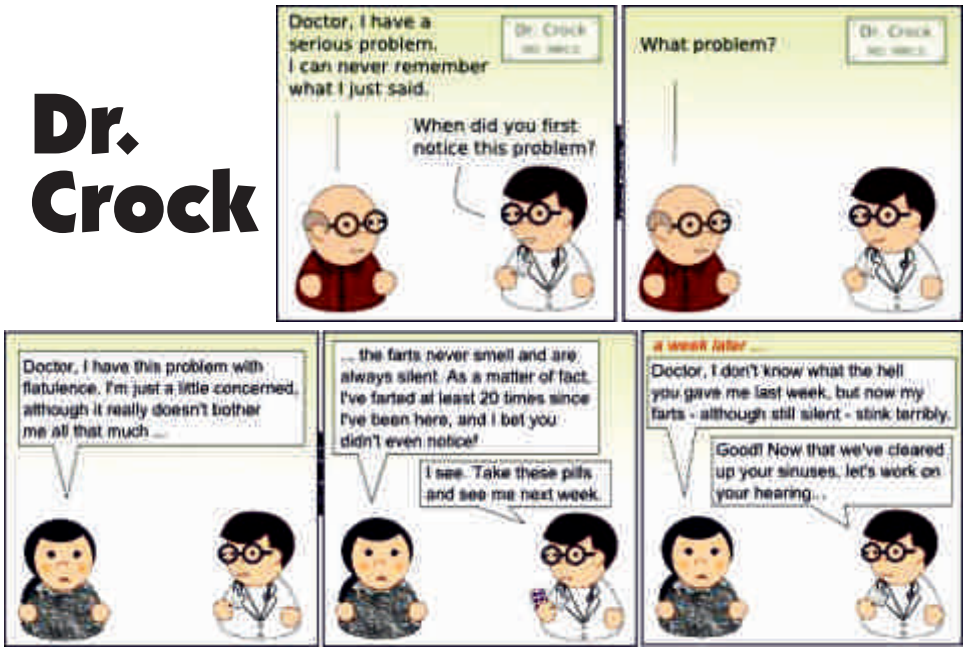
Funny Bone

Dr. Crock



Answers in Exams by non medical students:

1. Antibody - One who hates his body
2. Artery - Study of Fine Paintings
3. Bacteria - Back door of a Cafeteria
4. Coma - Punctuation Mark
5. Gall Bladder - Bladder of a Girl
6. Genes - Blue Denim
7. Labour Pain - Hurt at Work
8. Liposuction - A French Kiss
9. Ultrasound - Radical Sound
10. Cardiology - Advanced Study of Playing Cards...

*Source - Social Media