Aquatic Physiotherapy Group

Newsplash
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Aqua Abstracts December 2008

The following keywords are used to find current articles in *CINAHL and MEDLINE*
"hydrotherapy"
"aquatic physical therapy"
"aquatic therapy"
"water exercise"

Brady B, Redfern J, MacDougal G, Williams J. The addition of aquatic therapy to rehabilitation following surgical rotator cuff repair: a feasibility study. *Physiother Res Int.* 2008: Sep;13(3):153-61

ABSTRACT:

BACKGROUND AND PURPOSE: Rotator cuff tears are frequently encountered in medical outpatient settings and often require surgical repair to achieve desirable functional outcomes. However, the optimal form of post-operative rehabilitation of rotator cuff repairs remains unidentified by the research literature. The aim of this study was to determine the feasibility of implementing and investigating the effect of a combined aquatic and land-based rehabilitation programme in the post-operative rehabilitation of rotator cuff tears.

METHODS: A cohort of 18 subjects undergoing rotator cuff repair were examined over a treatment period of 12 weeks. Twelve subjects participated in a combined aquatic and land-based programme, while six subjects received a standard land-based protocol. Passive range of motion and the Western Ontario Rotator Cuff Index outcomes were measured pre-operatively and at three, six and 12 weeks, post-operatively. Subjective responses on patient's assurance and confidence in the value of the exercises (questionnaire using an 11-point Visual Analogue Scale (VAS)) were collected at 12 weeks for both groups.

RESULTS: There was a significant improvement in both range of motion and Western Ontario Rotator Cuff scores in all subjects with treatment ($p < 0.001$). Furthermore, participation in aquatic therapy significantly improved passive flexion range of motion measures at three weeks (mean 46 degrees , 95% CI 17-75, $p = 0.005$) and six weeks (30 degrees , 95% CI 8-51, $p = 0.01$). There was no significant difference in the attendance rates (80% in both groups) or patients perceptions of the programmes (100% confidence and assurance in both groups).

CONCLUSION: The implementation of a combined aquatic and land-based physiotherapy programme following surgical repair of the rotator cuff is feasible and presents a potential viable alternative to conventional land-based exercise with comparable outcomes.

Noh D, Lim J, Shin H and Paik N (2008):
The effect of aquatic therapy on postural balance and muscle strength in stroke survivors — a randomized controlled pilot trial

Clinical Rehabilitation, Vol. 22, No. 10-11, 966-976

Objective: To evaluate the effect of an aquatic therapy programme designed to increase balance in stroke survivors.
Design: A randomized, controlled pilot trial.
Setting: Rehabilitation department of a university hospital.
Subjects: Ambulatory chronic stroke patients (n = 25):13 in an aquatic therapy group and 12 in a conventional therapy group.
Interventions: The aquatic therapy group participated in a programme consisting of Ai Chi and Halliwick methods, which focused on balance and weight-bearing exercises. The conventional therapy group performed gym exercises. In both groups, the interventions occurred for 1 hour, three times per week, for eight weeks.
Main measures: The primary outcome measures were Berg Balance Scale score and weight-bearing ability, as measured by vertical ground reaction force during four standing tasks (rising from a chair and weight-shifting forward, backward and laterally). Secondary measures were muscle strength and gait.
Results: Compared with the conventional therapy group, the aquatic therapy group attained significant improvements in Berg Balance Scale scores, forward and backward weight-bearing abilities of the affected limbs, and knee flexor strength ($P<0.05$), with effect sizes of 1.03, 1.14, 0.72 and 1.13 standard deviation units and powers of 75, 81, 70 and 26%, respectively. There were no significant changes in the other measures between the two groups.
Conclusions: Postural balance and knee flexor strength were improved after aquatic therapy based on the Halliwick and Ai Chi methods in stroke survivors. Because of limited power and a small population base, further studies with larger sample sizes are required.

Resende SM, Rassi CM, Viana FP. Effects of hydrotherapy in balance and prevention of falls among elderly women. Rev Bras Fisioter. 2008;12(1):57-63.

Background: Hydrotherapy is used to treat rheumatic, orthopedic and neurological disorders. It has been the subject of investigations regarding balance recovery in elderly people. Objective: To evaluate the effect of a hydrotherapy program for balance, in relation to the risk of falls in elderly women. Methods: This was a quasi-experimental before/after study without a control group. Twenty-five elderly women were evaluated using two scales: the Berg Balance Scale and Timed Up & Go. The subjects underwent, subsequently, a low to moderate intensity hydrotherapy program for balance, which consisted of three phases: a phase of adaptation to the aquatic environment, a stretching phase and a phase of static and dynamic balance exercises. The program was applied for 12 weeks, with two sessions per week, each session lasting 40 minutes. The elderly women were reassessed after the sixth and twelfth weeks of the hydrotherapy program. The data were analyzed statistically by means of Student's *t* test for paired samples and the Wilcoxon test. Results: Hydrotherapy promoted significant increases in the elderly women's balance, as assessed using the Berg

Balance Scale (p< 0.001) and the Timed Up & Go test (p< 0.001). There was also a reduction of the scores in a scale of risk of falls (p< 0.001), according to the model of Shumway-Cook et al. Conclusions: It can be suggested that this hydrotherapy program for balance gave rise to an increase in balance and a possible reduction in the risk of falls among these aged women.

Key words: hydrotherapy; physical therapy; musculoskeletal equilibrium; accidental falls; aged person.

Link to article at http://www.scielo.br/pdf/rbfis/v12n1/en_11.pdf

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McVeigh JG, McGaughey H, Hall M, Kane P. The effectiveness of hydrotherapy in the management of fibromyalgia syndrome: a systematic review. *Rheumatol Int.* 2008

Hydrotherapy is often used in the treatment of fibromyalgia syndrome (FMS), however there has been limited evaluation of its effectiveness. The aim of this systematic review was therefore to examine the effectiveness of hydrotherapy in the management of FMS. AMED, BNI, CINAHL, The Cochrane Library, EMBASE, MEDLINE, ProQuest, PubMed, Science Direct and Web of Science were searched (1990–July 2006). Key words used 'fibromyalgia' and 'hydrotherapy', 'balneotherapy', 'aqua therapy', 'pool therapy', 'water therapy', 'swimming', 'hydrogalvanic', 'spa therapy', 'physiotherapy', 'physical therapy' and 'rehabilitation'. Searches were supplemented with hand searches of selected journals. Randomised controlled trials (RCTs) were assessed for methodological quality using the van Tulder scale. Ten RCTs met the inclusion criteria. Mean methodological quality was 4.5/9 on the van Tulder scale. Positive outcomes were reported for pain, health-status and tender point count. There is strong evidence for the use of hydrotherapy in the management of FMS.

Keywords Fibromyalgia - Hydrotherapy - Systematic review - Physiotherapy

Continuing Education Report

Is it worth getting wet?

*Article reproduced from IN MOTION

Getting wet is worth it for a broad spectrum of conditions across many areas of physiotherapy, according to speaker Mrs Jenny Geytenbeek, musculoskeletal and aquatic physiotherapist from South Australia, who presented research evidence on the benefits of aquatic physiotherapy to a sell out audience of physiotherapists, medical practitioners and special guests at the Kooyong Lawn Tennis Club for the 2008 Winter Physiotherapy Breakfast on Friday 25th July 2008.

The expert panel, comprising Professor Rachelle Buchbinder, rheumatologist and clinical epidemiologist at Cabrini Hospital, Dr Richard Clement rehabilitation physician at Casey Hospital, and Mrs Anne Daly, musculoskeletal physiotherapist at the Austin, provided their comments and were active participants in the animated Q & A session that followed the presentation.

Breakfast attendees gave top marks to the presentation and panel discussion at this very popular Winter Breakfast venue. This fifth Winter Physiotherapy Breakfast was run in conjunction with the Aquatic Physiotherapy Group, Victorian Chapter.

Acknowledgments:
The Victorian Branch wishes to acknowledge the sponsorship provided by Aqua Science Consultations Pty Ltd, Guild Insurance and Financial Services, and Pro-Am Australia.

The branch also thanks the organising team – Belinda Cary, Catherine Granger, Bronwyn McIlveen, Jenifer Lake and Bisa Surla.

Want to Borrow the DVD?
A DVD of the 2008 Winter Physiotherapy Breakfast has been sent to the chairs of all the Country Regional Groups in Victoria. Individual members who would like to

borrow a DVD of Jenny Geytenbeek's presentation should contact Clare Gori at the Victorian branch Office (Clare.Gori@physiotherapy.asn.au or 03 9092 0866). (reprinted with permission from In Motion September 2008)

Aquatic Level 2 Courses

12 physios attended the lower limb course in Melbourne . The course covered principles of Bad Ragaz and Halliwick with emphasis on facilitation of movement

Halliwick/ Trink Rehab, Lower Limb Rehab Upper and Lower Limb Courses – Johan Lambeck.

Johan Lambek continued after the Perth Aquatic Symposium with, lower limb and trunk rehab courses in Sydney and Melbourne.

Queensland Evening Lecture Report

LYMPHOEDEMA

On Nov 3rd Dr Robyn Box and Hildegard Reul-Hirche presented an excellent lecture on Lymphoedema, reviewing current assessment, outcome measures and treatment principles with a practical on-land demonstration of exercises they use in water. They also presented some of the provisional findings of their upper and lower limb pilot study research projects in which they are evaluating the effects of aquatic physiotherapy on Lymphoedema patients.

It was a very informative talk and if their preliminary findings are substantiated with further research, may dispel some of the myths that temperature and exercise duration/vigor are major obstacles for Lymphoedema patients.

Traditionally decongestive exercise for lymphoedea patients has been slow, rhythmical, and sequential exercise of short duration with minimal repetitions and no resistance. However we know there are many benefits from more vigorous

exercise. In their randomized controlled study for upper limb lymphoedema, participants did self paced aquatic exercise for 45min 3 x per week for 4 weeks. This included a warm up, cardiovascular activities, a cool down, stretches and deep breathing with self regional lymph massage. All participants had stable lymphoedema.

They found that with a gradual, monitored increase in activity, their clients could exercise quite vigorously for 45min in temperatures of 32-34° with no adverse effects. Given that the hydrostatic compression of water mimics that of compression bandaging and the warmth of the water tends to reduce pain and reduce soft tissue and muscle tightness, water is logically a great exercise medium for these clients and may help recruit alternative lymphatic pathways. It was also very clear from their talk that accurate assessment is essential and treatment is very much tailored for the individual.

They are currently recruiting participants for the second part of their lower limb lymphoedema study and need more participants. If you have clients that are stable and may be suitable, please contact Robyn Box on qlbop@bigpond.com or Hildegard on Hildegard_Reul-Hirche@health.qld.gov.au .

Link to Aquatic Physiotherapy Evidence Based Practice Guide

If you missed the link to the 2008 Aquatic Physiotherapy Evidence Based Guide to summary (15 pages) below

http://physiotherapy.asn.au/index.php/groups/aquatic-physiotherapy/resources-clinical

The full Guide (100+pages) is still being uploaded on the APA website and will be available soon. All members will receive a direct e-mail when this happens.

Early Aquatic Physiotherapy for Cerebral Palsy

Julie Harrison, Aquatic Physiotherapy Symposium, Perth 2008

When should we begin aquatic physiotherapy?

Why do we treat CP children in the water?

- It's fun, kids love water
- Keeps them active
- Physio can't think what else to do with them
- Reduced gravity, but we live on land
- Normal kids have swimming lessons
- So they can learn to swim

Cerebral Palsy

Different types of CP

- Quadriplegics
- Diplegics
- Hemiplegics

Based on location of brain injury/dysfunction

- 80% High tone (pyramidal)
- 10% Low tone (extrapyramidal) - weak & difficulty controlling movements – athetosis, ataxia, dystonia, chorea
- 10% Mixed (spasticity & involuntary movements**)**

People with cerebral palsy are all unique

Normal Development

- Babies are born helpless → within 1 year they learn to reach, kick, roll, crawl, sit, stand, walk
- Development occurs cranial to caudal
- Gross motor – big muscles, neck, shoulders, arms, trunk, pelvis, legs
- Fine motor – small muscles, hands, feet
- Oral motor – movements face & hands
- In normal children rapid gross motor development occurs in the first 12 months & continues slowly for next 10years.
- A predictor of potential in children with CP - GMFCS (Gross Motor Functional Classification System Russel, 1993)
- Study on 585 CP's in 2000 & 657 in 2002 showed that most progress in motor function in CP's occurred between birth and 3 or 4yrs of age
- By the age of 7yrs most CP's have reached their potential
- Children at levels IV & V reached their potential earlier

Therefore for CP's it is absolutely crucial that physiotherapists intervene in the first 4 years of life.

Motor development requires:

- Strength
  - Head control
  - Trunk control

- Leg & arm control
- Co-ordination
- Integration of senses
- Motivation

In CP the obstacles to motor development include:

1. Muscle tone

2. Reflexes

3. Lack of postural stability

4. Muscle weakness

5. Lack of control & co-ordination

6. Poor integration of sensory input

7. Lack of motivation

Aquatic Physiotherapy

- Need to overcome the obstacles to motor development (muscle tone, reflexes, lack of postural control/stability & co-ordination, weakness)

AT THE SAME TIME

- Facilitate development of strong normal patterns of movement

Goals

- Like all areas of physiotherapy we need to work out our goals
- Goals & the type of treatment we use will vary with
  - type of CP
  - degree of disability
  - level of motivation to move
  - rate of progress as we begin to treat
  - funding & location of treatment (special school, Physio)
  - family understanding & support

A Framework for Neurological Aquatic Physiotherapy in Young CP Patients

- Normalize tone & reflexes
- Maintain normal passive ROM of joints and/or muscle length (elongate muscle after ↓ muscle tone to allow for growth)
- Improve postural/core stability and strength
- Facilitate normal, strong co-ordinated patterns of movement
- Facilitate the development of correct function (eg. Head control, hands to midline, oro/facial function, rolling, sitting, sit to stand, steps, walking)
- Improve Sensory Integration (vestibular, tactile, proprioceptive, visual, auditory)
- Improve co-ordination, fitness, endurance (may include water safety or swimming)

Why Reflexes

Uncontrolled movements of the head in a neonate produce a Moro response, external support of the child's head & trunk result in more mature behaviours (reaching for objects, attending) (Amiel-Tinson, Grenier; 1980)

Stability

"There is a concept that an immature postural system is a limiting factor or a constraint on emergence of co-ordinated limb movements as well as inhibition of reflexes." (Shumway-Cook; Motor Control, 2001)

- Without the development of a basic level of core/postural stability it will be extremely difficult to develop normal movement patterns and overcome primitive reflexes
- CPs use many techniques (self stabilization, tone, braces, rods, equipment)
- Can we use the water to teach a very young CP about postural stability?

Head Control (with/without collar)

- Need to strengthen flexors
- Need to strengthen extensors (tummy time)

Trunk, scapula, pelvic stability

- Static Seaweeding
- Irritating seaweeding:
  - "keep your body straight like a tree"
  - "don't let me bend you"
- *External pertubations*

Stabilize scapula

Combination:
Position, scapula stability, UL strength, physio facilitation

Lower Limbs:
- cycling
- kicking with straight legs
- "open shut them, open shut them**"**

Strengthening with splints

- Facilitate greater use of gluts & quads
- Decrease cycling action & use of hamstrings
- Use of flippers

- Some CPs (especially athetoids) have so little head/postural control that they require lots of support to strengthen muscles so they can do functional activities
- May need to stabilize one part in order to get co-ordinated movement with another

Principle of Motor Learning

- Active process (motivation)
- Motivation
- Active exploration helps
- Demonstration
- Variability
- Practice
- Feedback

Co-ordination

Developmental stages/function as core postural stability develops

- Rolling
- Hands to midline

- Weight bearing through arms - propping
- Side sitting, sitting
- Crawling
- Squatting
- Sit to stand
- Stand, walking

% weight-bearing in water

- Proprioception is changed in the pool
- Is the pool detrimental for low tone children?
- Use of weight belts, manual pressure, techniques
- Different depths of water

Aquatic Physiotherapy is only part of the early intervention necessary for the appropriate of young children with cerebral palsy

If it does not improve the outcome should we use it?

Positions allowing movement when postural stability does not exist, primitive reflexes are not integrated

- Reflex inhibiting positions
  - Sidelying
- Tone normalization through weight bearing
- Splinting……

Muscle Elongation

- Need to elongate a muscle for it to grow
- Try to prevent deformities which lead to later problems (scoliosis, dislocating hips, severe painful contractures
- Many older CPs are in chronic pain (Liptak, 2001 significantly higher levels of pain in children with CP than normal)

Sensory integration comes into all activities

Fitness & Independent Movement in Water

- Breath control (Improvement in breath control can assist with speech)
- Rotation around transverse axis
- Rotation around longitudinal axis
- Return to safe breathing position
- Flotation
- Propulsion using feet
- Propulsion using hands

Testing the waters: Aquatic Therapy in Respiratory Disease

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Did you know that over 4 million Australians are living with chronic lung disease? That's nearly 20% of the population!

Did you know that over 2 million of these Australians are living with lung disease but are unaware of it?

Do you know how many of your hydrotherapy clients have a respiratory disease?

Chances are you treat many clients who have lung disease and both you and your client are unaware of it.

The most common respiratory diseases in Australia are asthma and chronic obstructive pulmonary disease (COPD). Asthma is a disease in which bronchoconstriction of smooth muscles cause airways to narrow. This narrowing often occurs in response to triggers and the salient feature is that the airway narrowing (or obstruction) is reversible with bronchodilator medications (eg. Ventolin). COPD is an umbrella term used to describe 2 conditions: emphysema and chronic bronchitis. COPD is characterised by mucus, air trapping, floppy airways and progressive airway narrowing which is not fully reversible.

The main cause of COPD is cigarette smoking and whilst up to 85% of people who have smoked will have some degree of this disease, it is not usually until the symptom of shortness of breath is noticed that treatment is sought.
Other respiratory diseases include bronchiectasis (a condition characterised by chronic abnormal dilatation of the bronchi and excessive mucus production), interstitial lung diseases (a group of lung diseases where the lung tissue is damaged in some way resulting in inflammation and scarring or fibrosis),lung cancer, and restrictive diseases (characterised by chest stiffness and decreased lung compliance; this may be due to an external structural abnormality, eg. kyphoscoliosis or an internal process such as pulmonary oedema).

Clients with respiratory disease may present to physiotherapy with breathlessness on exertion and/or at rest, difficulty removing secretions, frequent chest infections, limitations in performing functional activities, and reports of poor quality of life, anxiety and depression.

Traditional physiotherapy treatment consists of pulmonary rehabilitation which involves individual assessment and treatment encompassing land-based exercise training, disease education and self-management training.

Land-based exercise training has achieved Level A evidence (systematic review of randomised controlled trials) for improving exercise capacity and health-related quality of life in subjects with chronic respiratory disease and is therefore widely accepted as the cornerstone of pulmonary rehabilitation programs (Lacasse et al 2001). Experience, though, indicates the presence of co-morbid physical conditions in COPD patients contributes to a high number of 'drop-outs' from pulmonary rehabilitation programs.

Participation in the common land-based exercises is often difficult or impossible for obese patients or those with neurological, orthopaedic or musculoskeletal

conditions. With a high drop out rate in pulmonary rehabilitation programs, it is important to explore alternative exercise options to enable patients with chronic respiratory disease and co-morbid physical conditions to complete some form of exercise training. Water-based exercise had previously been thought to be unsafe for the cardiovascular and respiratory systems due to the increased cardiac output and increased chest wall pressure that results from immersion in water. However, recent research indicates that exercise training in water is safe and effective for COPD and asthmatic subjects with no significant change in respiratory rate, heart rate or oxygen saturation (Wadell et al 2004; Emtner et al 1998; Perk et al 1996).

What are the main safety considerations you need to be aware of in aquatic therapy for clients with respiratory disease?

The major respiratory effect of immersion is an increase in the work of breathing due to the hydrostatic pressure of water on the chest wall. This is poorly tolerated by clients who already have an increased work of breathing at rest, so consider position and depth carefully. Warn your client that initially shortness of breath may increase. You may need to factor in frequent rest periods where the chest wall is elevated out of the water to remove the hydrostatic pressure and relieve work of breathing. Breathless clients should be encouraged to use their controlled breathing and shortness of breath management techniques such as forward leaning posture with upper limb support and pursed lip breathing for relief. Some respiratory patients have been prescribed supplemental oxygen for use on exertion.

This should not be seen as a contraindication to aquatic therapy, rather more an issue which needs some organisation and coordination. A portable oxygen bottle should be secured on the pool side. Ensure sufficient oxygen tubing length (depending on exercises and travelling distance). The patient can wear their own nasal prongs. Ensure other pool clients are aware of the oxygen tubing (which is generally green or clear in colour and easily camouflaged in the water) and ensure there is enough space provided around the client. You may find it beneficial to liaise with a cardiorespiratory physiotherapist for further advice. If you regularly have respiratory patients in the aquatic environment it might be worth considering keeping respiratory supplies close by (in addition to your normal emergency equipment). Appropriate medication (bronchodilators) and oxygen therapy equipment would be considered essential. Clients should be encouraged to carry their own medications, keep them poolside and use them prior to exertion.

Anxiety is a co-morbid condition not to be underestimated in this population. There is a high incidence of anxiety and panic disorders in people with respiratory disease so consider anxiety as an additional cause of breathlessness. One-to-one treatment may be required initially.

Finally, don’t forget to keep tissues and a rubbish bag handy. Even the smallest amount of exertion can lead to a large increase in breathing effort which may lead to sputum expectoration. Coughing and spluttering is a good thing in respiratory disease (it’s better out than in) but this is not a fluid that mixes well with water!

So, now that you know aquatic therapy is safe in respiratory disease there is no need to hesitate getting my breathless buddies in the water!

****The following is the first in a series of articles for Newsplash by Darren Elliot who presented at the Aquatic Symposium in Perth. (Ed)*

Aquatic Physiotherapy and Diabetes

Darren Elliot

Pathophysiology of type 1 and type 2 diabetes

The epidemic that we know as diabetes is a worldwide problem. Before we delve into the topic and attempt a greater understanding, let's get rid of some old terminologies that are both incorrect and misleading.

1) 1) The use of the term "blood sugar levels" to describe a patient's state of glycemia is a misnomer. Diabetes is a chronic metabolic disorder of *glucose* metabolism, not sugar metabolism. Glucose is the byproduct of the chemical breakdown of many constituents of food such as fat, carbohydrate, and sugar. The reason for pedantically addressing this is two fold: firstly that it is plainly incorrect, and secondly it changes a patient's (and a therapist's) understanding of the condition, and therefore the management of their condition. If for example, you have a patient who eats large servings of pasta 1-2 times per day, and has a relatively 'normal' intake of sweets they will not see their dietary habits as needing modification if they only see it as a sugar problem. The old mentality of keeping the patient in the dark regarding their condition is thankfully eroding, and for those who think their patients won't understand a term such as glucose, you may want to use a simple fuel/petrol analogy to bridge the understanding gap.
2) 2) NIDDM and IDDM are sometimes seen as interchangeable with type 2 and type 1 diabetes. The reason these terms are not accurate is that approximately 50% of type 2 diabetics will take insulin as a result of the progressive nature of the disease (irrespective of medical treatment chosen) [1,2]
3) 3) Similarly "adult onset diabetes" is no longer used in describing type 2 diabetes, with this lifestyle disease being reported increasingly in children and adolescents. In a study done at Princess Margaret Hospital (Perth, WA) between 1990 and 2002, 43 patients were diagnosed with type 2 and the average age at time of diagnosis 13.6 years. Of these patients, 59% had hypertension and 24% had hyperlipidemia.[3]

As physiotherapists, whether working in hospital, community or private settings, chances are that a good proportion of our patients will have diabetes (either diagnosed or undiagnosed). More than 45% of the older population (in the US) meets the current diagnostic criteria for type 2 diabetes or pre diabetic state[4]. Almost 1 in 4 Australians over the age of 25 has either diabetes or a condition of impaired glucose metabolism[5], and for every known case of diabetes, there is another undiagnosed case[6]. There is a lot of research at the moment that is sub categorizing the types of diabetes even further, but this excerpt will not talk in any further detail than type 1 and type 2.

Type 1 diabetes is a disease caused by autoimmune obliteration of the pancreatic beta cells and accounts for 10-15% of the diabetic population. Type 2 diabetes is a lifestyle disease, which occurs as a result of insulin resistance and beta cell dysfunction [7]. The resultant hyperglycemia has many damaging effects on the micro and macrovasculature, kidneys, neural system, heart, eyes and connective tissue. This damage can lead to a whole host of complications such as

heart attack; stroke; kidney failure; peripheral vascular disease; retinopathy; decreased or lost sensation and thermoregulation; amputation; decreased balance; and decreasing quality of life to name a few.

The typical patient with type 2 diabetes has an "apple shape" or distribution of fat concentrated around the abdomen. Fat is no longer thought of as a passive storage site for extra energy, but in fact it is recognized as a metabolically active organ[9]. Adipose tissue excess or obesity, particularly in the visceral compartment, is associated with insulin resistance, hyperglycemia, dyslipidemia, hypertension, and prothrombotic and proinflammatory states[8]. The reason visceral fat is more predictive of diabetes than other fat storage sites, is because visceral fat secretes hormones specifically effecting energy metabolism, whereas other fat storage sites may not. Add to this the proximity of the hepatic portal vein to the visceral fat stores, and it is a tissue that secretes hormones involved in energy metabolism with direct access to the liver.

In summary visceral fat secretes hormones that directly disturb energy metabolism, creating insulin resistance. Insulin resistance causes the pancreas to compensate by secreting a greater amount of insulin to achieve the same result. Eventually the pancreas output decreases, and is unable to offset the insulin resistance. This is when the pre diabetic states of impaired glucose tolerance and impaired fasting glucose are evident/diagnosed. Once the pancreas' output is reduced enough, glycemic levels within the body rise to a level where type 2 diabetes is categorised (fasting glucose >7mmol/L; and 2hrs post Glucose Tolerance Test >11.1). At time of diagnosis, patients will have approximately 50% loss of pancreatic beta cells[10].

Hopefully this excerpt has given a nice base to work from, the next instalment on diabetes will address identifying patients who are at risk of hypoglycaemic events and discuss pre and post exercise blood glucose testing.

If you have any queries please feel free to email me
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