Pre-manipulative testing of the cervical spine review, revision and new clinical guidelines

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Abstract

Members of the Manipulative Physiotherapists Association of Australia (now Musculoskeletal Physiotherapy Australia) were surveyed to determine their use of cervical manipulation, compliance with and attitudes to the Australian Physiotherapy Association’s (APA) Protocol for Pre-manipulative Testing of the Cervical Spine, and the incidence of adverse effects from cervical manipulation. The questionnaire was mailed to 740 members and returned by 480 members (65%).

Cervical manipulation (84.5%) and passive mobilization (99.8%) were used by a high percentage of respondents. Most were familiar with the protocol with 63% supporting its continued endorsement. Adverse effects were reported at a rate of one per 1000 years of practice (or 0.003/week). The most common effects were symptoms potentially related to VBI (94.4% responses), with no reported major complications. Only 37.1% of respondents always informed the patient about potential dangers of cervical manipulation and consent was sought on every occasion by 33% of respondents.

The results suggest that the use and interpretation of the protocol are variable among members of MPA. The risk of adverse effects from manipulative (musculoskeletal) physiotherapy practice, including cervical manipulation, appears to be very low.

Recommendations for revision of the protocol were made on the basis of results of the survey and treatment diary, in addition to a review of the literature related to testing for vertebro-basilar insufficiency, adverse incidents related to cervical mobilizing and manipulative technique, differentiating features of VBI related dizziness and vertigo related to benign paroxysmal positional vertigo (BPPV) and current issues surrounding informed consent. Finally, a summary of the content of the new Clinical Guidelines for Pre-Manipulative Testing of the Cervical Spine (APA, 2000) is provided.

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1. Introduction

The Australian Physiotherapy Association (APA) endorsed the APA Protocol for Pre-Manipulative Testing of the Cervical Spine (STA, 1988). Over the past decade, advances in research (Grant and Trott, 1991; Refshauge, 1994; Rivett and Milburn, 1996; Rivett et al., 1999; Johnson et al., 2000; Zaina et al., 2003), and changes in the medico-legal system in Australia (Rogers v Whitaker, 1992) have fuelled discussion regarding the validity of the protocol (for example, Grant and Trott, 1991; Rivett, 1995; Grant, 1996a, b). Concerns expressed anecdotally and as part of an APA review included:

- The time consuming nature of applying the protocol (Grant, 1994).
- The provocative nature of the tests themselves (Di Fabio, 1999).
The reliability and validity of the test procedures, questioning whether they actually detect alterations in blood flow in the vertebro-basilar system (Assendelft et al., 1996).

- The lack of validated research underpinning the protocol (Kunnasmaa and Thiel, 1994).
- Failure to address the legal requirements pertaining to the provision of informed consent.

In response to the expressed opinions, an attitudinal survey and treatment diary were mailed to all members of the Manipulative Physiotherapists' Association of Australia (now Musculoskeletal Physiotherapy Australia—MPA). The aims of the study were:

1. To determine the proportion of members using cervical manipulation (high velocity thrust [HVT] techniques) and the frequency of their use in each region of the cervical spine.
2. To determine the proportion of members using non-thrust techniques (passive mobilization) and cervical traction in each region of the cervical spine.
3. To determine the members' opinions of, and rate of compliance with, the APA Protocol for Pre-Manipulative Testing of the Cervical Spine.
4. To quantify adverse effects associated with the use of cervical manipulation and other cervical spine procedures.
5. To determine the rate of compliance with the legal requirement to provide information to, and obtain consent from, a patient prior to the use of cervical manipulation.

2. Methods

Following granting of ethical approval from the University of South Australia Human Research Ethics Committee, a sample survey was reviewed by a focus group in one Chapter, revised and then trialed in three Chapters of MPA. The survey questions contained multiple set response options plus free text opportunities to express opinions. After revision following this process, a final questionnaire was developed and sent to all 740 members. In addition to the survey, members were requested to prospectively record their use of cervical manipulative techniques and the protocol for one week of clinical practice in a daily diary. Responses to both the survey and diary were anonymous.

3. Results

The attitudinal survey was returned by 419 members in current clinical practice and 34 members not in current clinical practice. A further 27 members indicated in writing that they did not wish to participate—their reasons were not recorded (65%). The diary was completed by 287 members (38.7%). The diary was not linked by identification number to the attitudinal survey, and thus represented an independent set of responses.

3.1. Use of HVT techniques

Cervical spine HVT techniques were used by 84.5% of currently practising respondents (n = 419), in the upper, middle and lower cervical spine, by 83.4%, 84.7% and 98.3% of respondents, respectively.

Of the 287 respondents to the diary, 34.8% performed upper cervical spine HVT techniques and 41.8% performed lower cervical spine HVT techniques in the recording week. We assumed that the physiotherapists who reported using upper and lower cervical manipulations were not mutually exclusive, and we took the higher figure (41.8% respondents used HVT in the cervical spine) to include those who also undertook upper cervical HVTs. Thus, overall, 41.8% used HVTs on the cervical spine. A total of 1002 HVT techniques was performed in the cervical spine by 141 physiotherapists in the diary week using a variety of manipulative techniques. This is an average HVT technique rate of 3.5 manipulations per diary respondent per week. Specific HVT techniques commonly included lateral flexion, longitudinal, postero-anterior (PA) thrust, transverse and rotary techniques.

3.2. Use of non-thrust (passive mobilization) techniques

From the survey, passive mobilization (non-thrust) techniques were used by nearly all respondents (99.8%), who applied them on average to 90.4% of their cervical patients. Respondents used a variety of passive mobilization techniques with similar frequency in the upper, middle and lower cervical spine (96.8%, 96.7% and 96.6%, respectively). Cervical traction was used by 94.9% respondents.

To determine the most commonly applied HVT and non-thrust techniques, the diary data were used (actual numbers of applications of most commonly used techniques over a standard [1 week] time frame). These figures show that the most commonly practised technique in each region of the cervical spine, and overall, was the passive accessory intervertebral movement (PAIVM).

3.3. Familiarity with the protocol

Ninety-eight per cent of respondents were familiar with the protocol and 85% had read it within the last 4 years. The most common reason for using the protocol was concern that the proposed treatment technique...
would stress the vertebro-basilar arterial system. Most respondents (67.4%) considered the protocol valuable in their manipulative/musculoskeletal physiotherapy practice, although 14.2% used it only to satisfy legal requirements. The majority of respondents (63%) supported continued endorsement of the protocol, 25% were unsure, leaving only 12% who definitely felt that endorsement should not be continued. Seventy-five per cent indicated that the protocol was useful to them for other than medico-legal reasons, and 70% would continue to use it even if it were no longer endorsed. About half of the respondents (54.2%) felt that use of the protocol gave them a sense of security prior to the use of HVT techniques, despite being aware of the limitations of the physical test procedures.

The respondents who indicated that the APA should not endorse the use of the protocol \((n = 54)\) raised the following issues about its use:

- It is not clinically relevant (20.3% of this group of respondents).
- It does not identify patients at risk (37.7%).
- It places unnecessary restrictions on the use of cervical manipulation (21.9%).
- It discourages physiotherapists from using cervical manipulation (50%).
- It places an onerous legal burden on physiotherapists (37.9%).

From the text responses, further comments were noted:

- The time cost of applying the protocol is unrealistic.
- The questionable validity of the tests themselves and the provocative nature of the protocol tests are of concern.
- The requirement to provide information and ask for consent prior to use of HVT techniques acts as a deterrent, leading to reluctance on the part of the therapist to request consent and on the part of the patient to provide such consent.

### 3.4. Adverse effects

Adverse effects associated with examination or treatment of the cervical spine were recalled by 447 respondents at some time in their professional career (400 currently practising and 47 not in current practice). The remainder of respondents recalled no adverse effects associated with examination or management of the cervical spine. Of those patients with adverse effects, 15.9% required medical attention, while the remainder resolved without intervention. The most common effects related to passive mobilizing techniques (27.5%), examination techniques (20.4%) and HVT techniques (16.1%). The majority of respondents (77%) could not identify any features that would have alerted them to the patient’s response, although the majority of techniques contained a component of rotation. Of these respondents, 40% had applied the protocol prior to treatment. Of the patients who had suffered an adverse reaction and for whom the protocol had not been applied, 45% had features for which use of the protocol was indicated.

The incidence rate for adverse effects (which is an estimate, as a result of amalgamation of categories of 2–10 and 10+ complications) translates to 168.5 per 1000 manipulative/musculoskeletal physiotherapy years of practice (or 0.003/week). This was calculated by determining the time over which the 447 respondents had practised manipulative/musculoskeletal physiotherapy (average 10.2 years (SD 6.4, range 1–31, median 9), with a sample total of 4601 physiotherapist years of manipulative/musculoskeletal practice, coupled with the estimated number of adverse effects (ever) as reported by this sample.

Information on 291 types of effects within the past 2 years was obtained from 211 survey responders (46.6%). Calculations were performed for the rate of adverse effects for HVT, passive physiological intervertebral movements (PPIVMs), PAIVMs, cervical traction and other cervical treatments. Adverse effects were found to occur at a rate of:

- One per 177.5 therapist weeks for HVT.
- One per 184 therapist weeks for PPIVMs.
- One per 180 therapist weeks for PAIVMs.
- One per 100 therapist weeks for cervical traction and other cervical techniques.
- A total of 1.38 adverse effects per therapist over the 2 year period (0.01/week).

The rate for HVT translates into an estimate of one effect per 50,000 HVT procedures. This more specific information supported the low rate of adverse effects associated with cervical techniques.

The most common complications were symptoms potentially associated with the vertebro-basilar system (accounting for 94.4% responses) [that is, dizziness, diplopia, dysphagia, drop attacks, difficulty in swallowing, nausea]. Specifically, there were no reported major complications in this sample.

### 3.5. Information and consent

Provision of information to the patient about dangers involved with HVT techniques (other than death) was low. Only 37.1% of respondents to the survey always informed the patient about these dangers and 48.1% sometimes did. Dangers discussed included dizziness (29.1%), nausea (22.5%), radiculopathy (12%), stroke (27.7%) and various other complications (8.5%). Death or permanent disability were specifically included as a
danger by 23.3% of respondents, while some never mentioned either (16%) and 33.1% only introduced the subject if the patient asked for further information.

Of those respondents who did not include information regarding death or disability, 33.7% felt uncomfortable about doing so, 30.3% thought that the patient would refuse HVT techniques as a treatment option, 15.4% considered that it was not relevant and 2.9% believed that it was not legally required. The remainder (17.6%) expressed a variety of reasons regarding lack of information exchange.

Consent was rarely gained on every occasion of manipulation. Consent was sought by:

- 32.9% respondents for every HVT technique (including multiple techniques on the one occasion);
- 33.4% respondents at every occasion at which a HVT technique was used;
- 20.3% respondents only at the first occasion at which a HVT technique was used.

Consent was never sought by 1.9% respondents and 11.5% respondents did not seek consent with every patient. Seeking consent was always linked to the provision of information about the dangers of manipulative therapy techniques by 40.2% respondents, and sometimes by 49.7% respondents. The remaining 10.1% respondents never linked these two issues.

4. Discussion

There was a moderate response from the membership (65%), with 61.2% actually completing the survey, and a poor response to the diary (38.7%). However, it appeared that responses were received from members who had a strong positive or negative opinion or experience regarding the use of the protocol. The intensity of responses suggested that few members took a middle ground. Compliance with completing the diary would have been facilitated by clerical assistance in tallying patient and treatment numbers, thus potentially biasing against respondents without such support. Moreover, the weekly diary may not have been completed by those physiotherapists who used cervical manipulation less than once per week as the diary covered a snapshot of a single week’s practice.

No other studies were found in which frequency of use of HVT and non-thrust techniques in a national professional association with specialized training in manipulative/musculoskeletal physiotherapy have been reported. Michaeli (1993), Rivett and Milburn (1996) and Grant and Niere (2000) have all undertaken different studies of manipulative/musculoskeletal physiotherapists or those with manipulative therapy training, but in each case, smaller samples were used. In, 1991, Grant and Trott reviewed compliance with the protocol using a random sample of 10% of members of the APA (n = 727). A return rate of 63% was reported (n = 455) representing a similar sample size and response rate to the present study. However, in Grant and Trott’s (1991) sample, further reported in Grant (1994, 1996a, b), only 18.5% (n = 84) reported using manipulative techniques, even though manipulative physiotherapy was listed as the field of practice by, 198, a much smaller sample than in the current study.

Frequency of use of HVT and non-thrust techniques reflects that anticipated from a sample of members of MPA, with virtually 100% use of non-thrust techniques and 84.5% overall use of HVT techniques. Also as anticipated, a higher percentage of members used HVT techniques in the lower cervical spine than in the middle or upper regions, presumably because of the perception of a lower risk of damage to the VA with techniques applied to this area (Klougart et al., 1996a, b).

Compliance with the protocol was poor, with only 66% respondents reporting its implementation prior to the first use of HVT techniques and 33.6% using it prior to subsequent HVT procedures. This result reflects a similar level of compliance reported by Grant and Trott (1991) and represents a less than desirable compliance rate for a protocol mandated by the professional body prior to the administration of cervical manipulation.

However, despite the poor compliance, only a small percentage (12%) of respondents definitely did not support endorsement of the protocol. Conversely, 63% definitely supported its continued endorsement and 66.7% believed the protocol was of value to their clinical practice, consistent with the findings of Grant and Trott (1991) who reported 66% endorsement. The objections to protocol use reflected similar concerns expressed in Grant and Trott (1991), including its time consuming nature and the need to obtain informed consent reducing opportunities to undertake HVT procedures.

The rate of adverse effects from HVT techniques of the cervical spine (1 per 50,000 manipulations) was very low, with no evidence of catastrophic misadventures. The survey instrument precluded collection of data on the precise number of incidents, particularly as the data were retrospective. However, the results do provide a snapshot of the frequency and nature of incidents that have occurred within a large sample of postgraduate educated users of HVT techniques in the cervical spine. The argument could be made that any therapist who had been involved in a catastrophic incident would remember the incident vividly and would therefore report it accurately. However, the counter argument, that such therapists may have chosen not to respond to the survey, could be equally valid. These limitations are acknowledged and reflected in interpretation of the results of this study.
Interestingly, adverse responses were reported with non-thrust (27.5%) and examination techniques (20.4%) in addition to HVT techniques (16.1%). Techniques associated with the highest frequency of adverse responses were those involving some component of rotation, consistent with previous research (Klougart et al., 1996a,b). Examination techniques included various types of examination procedures—active and passive physiological movements and PAIVMs.

In a review of the reported incidence of mishaps related to cervical manipulation, Rivett and Milburn (1996) highlighted the limitations in the information currently available. Estimated rates of mishap varied from less than one in 5,000,000 in a chiropractic study (Jaskowiak, 1980) to one in 50,000 in a medical report (Gutmann, 1981). However, all studies were, like the present one, retrospective with consequent inherent recall bias, and most involved medical practitioners and chiropractors. A single published retrospective study (Michaeli, 1993) of cervical manipulation by physiotherapists was highlighted by Rivett and Milburn (1996). The sample population (n = 88) had only 100 h postgraduate education in manipulative physiotherapy, thus not reflecting the education levels of MPA members—formal postgraduate qualifications in manipulative physiotherapy. However, a risk of minor or transient complications of approximately one in 1756 manipulations was reported. In the present study, the rate of adverse effects from HVT techniques was one in 50,000—considerably lower, perhaps reflecting the higher level of formal manipulative physiotherapy education in the present sample.

Rivett and Reid (1998) investigated the incidence of neurovascular insult attributed to cervical manipulation by physiotherapists in New Zealand, reporting at least four cases in a 7 year period (1991–1997). These authors also provided an estimate of the number of cervical manipulations performed by manipulative/musculoskeletal physiotherapists in the same timeframe, calculating an approximate incidence rate of one cerebrovascular accident (CVA) for every 163,371 manipulations. It is impossible to provide direct comparison from this study to the present one, as no CVAs were reported in the present study.

Clearly, the results of this study do not provide the answers to the question of incidence of complications because of the limitations of the study design. Until a large prospective study is completed, the risk is likely to continue to be under-estimated.

There is increasing emphasis on the teaching of short lever HVT techniques as alternatives to the more traditional techniques (Gross et al., 1996; College of Physical Therapists of Alberta, 2000; Gibbons and Tehan, 2000; Monaghan, 2000; Hing et al., 2003). These techniques are perceived to place less end-range rotary stress on the upper cervical spine. Continuation of this direction of teaching would appear to be appropriate at this stage in light of the findings of the present study.

Following review of the results of the survey, the following changes were recommended:

- Review and modification of the protocol in the light of the most recent research available on the effect of cervical movement on blood flow in the vertebro-basilar system and its relation to provocation of symptoms.
- Shortening and simplification of the protocol for use with cervical manipulation and techniques involving end-range rotation of the cervical spine.
- Facilitation of the provision of information to patients prior to cervical manipulation.
- Development of a protocol for provision of information, obtaining consent to cervical manipulation and recording of the process.

To achieve these aims, the following steps were undertaken:

- An extensive review of the literature and evaluation of work in progress was undertaken, related to:
  - measurement of vertebro-basilar blood flow and the effect on flow of cervical movements;
  - provocation of symptoms associated with alteration of vertebro-basilar blood flow;
  - the incidence and possible causes of complications associated with manipulation of the cervical spine;
  - differentiation of symptoms of VBI from those of other sources.
- Medico-legal experts and physiotherapists with expertise on informed consent for therapeutic intervention were consulted, to help determine the optimal way to facilitate this process within a clinical practice setting.
- The structure and content of the protocol were reviewed.
- A draft set of clinical guidelines for pre-manipulative procedures for the cervical spine was developed and distributed to members of the professional body for comment, focus groups were held throughout the profession and, on the basis of feedback from this process, a new set of clinical guidelines produced.

4.1. The effect of cervical movement on blood flow in the vertebro-basilar system and its relation to provocation of symptoms

The effect of cervical movement on VA blood flow has been investigated in vivo using Doppler ultrasound. The findings of these studies are conflicting, leading some researchers to question the validity of pre-manipulative testing (Kunnasmaa and Thiel, 1994; Côté
et al., 1996; Grant, 1996a, b, Johnson et al., 2000). The earlier studies are summarized in Tables 1 and 2.

The results of many of these investigations are questionable as preceding reliability studies were not conducted or were, at best, limited in nature (Stevens, 1991; Refshauge, 1994), despite the well-known operator dependency of ultrasonographic examination (Johnson et al., 2000). Vessel identification error and inaccurate sampling due to non-visualization of the target vessel with continuous wave ultrasound and sampling at different parts of the artery, often upstream to the area potentially affected, may also have affected the results of some studies.

In response to this problem, Zaina et al. (2003) reported on an investigation of the effect on cervical rotation on VA flow using a reliable experimental protocol proposed by Johnson et al. (2000) and following an initial test–retest reliability study. Neither peak velocity nor volume flow rate was found to be significantly changed in a group of, 20 asymptomatic volunteers at both 45° and end-range contralateral rotation. However, the effects of pre-manipulative testing on a symptomatic population cannot be determined from this small study.

In a larger investigation on a patient population, Rivett et al. (2000) evaluated the effects of pre-manipulative testing on VA haemodynamics and whether these effects differed between patients demonstrating positive and negative clinical test responses. Colour duplex ultrasound with power Doppler imaging was used to measure haemodynamic parameters at C1–C2 during testing. Good reliability was shown (n = 20) for sampling of selected flow parameters at C1–C2 in various cervical positions. Patients were classified as either positive (n = 51) or negative (n = 49) to pre-manipulative testing, and then underwent an ultrasonographic examination in positions involving rotation and extension. While there were statistically significant haemodynamic changes during pre-manipulative testing, these changes were generally unlikely to be clinically significant. There were no meaningful significant differences in flow changes in any of the cervical positions between the two groups. Notably, 20 patients had total or partial vessel occlusion during testing, however only two of these displayed possible VBI symptoms at the time. It was concluded that pre-manipulative testing alone is clinically unlikely to distinguish between patients with varying degrees of flow impedance.

Table 1

<table>
<thead>
<tr>
<th>Study</th>
<th>Instrumentation and measurements</th>
<th>Sample population</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnetoli et al. (1989)</td>
<td>Cw Doppler US VA flow in rotation/extension</td>
<td>190 healthy volunteers 60 patients with VBI</td>
<td>Either diastolic flow loss or absent Doppler signal of contralateral VA in 6% of volunteers and 33% of patients</td>
</tr>
<tr>
<td>Stevens (1991)</td>
<td>Cw Doppler US VA flow at C1–C2 during positional testing</td>
<td>250 patients with an identified abnormal flow velocity pattern</td>
<td>Velocity in contralateral rotation reduced in 62%, increased in 20% Decreased flow velocity in extension in 18%</td>
</tr>
<tr>
<td>Refshauge (1994)</td>
<td>Duplex US Flow velocity at C2–C3 in 45° &amp; end-range contralateral rotation</td>
<td>20 healthy volunteers</td>
<td>Flow changes (usually increase) in 45°, significant trend for decreased velocity in full rotation 2 subjects had no flow at 45° rotation but no symptoms</td>
</tr>
<tr>
<td>Haynes (1996)</td>
<td>Cw Doppler US Maximum contralateral rotation</td>
<td>290 VAs</td>
<td>Cessation of Doppler signal in 5%</td>
</tr>
<tr>
<td>Rivett et al. (1999)</td>
<td>Colour duplex US Peak systolic &amp; end diastolic velocities &amp; resistance index at C2–C3 in extension, 45° &amp; end-range contralateral rotation &amp; combined rotation/extension</td>
<td>16 patients and 4 volunteers (10 positive, 10 negative to pre-manipulative testing)</td>
<td>Significant changes in flow velocity in end-range positions of rotation and rotation/extension No meaningful significant differences found between positive and negative subjects</td>
</tr>
</tbody>
</table>

CW = continuous wave; US = ultrasound; VA = vertebral artery; VBI = vertebro-basilar insufficiency.
in the patient history (Grant, 2002; Rivett, 1995, 1997). It also appears that, often, the symptoms detected during clinical pre-manipulative testing may be unrelated to alterations in blood flow in the VA.

4.2. Differentiation of symptoms of VBI from those of other sources

Clinical experience of vestibular rehabilitation physiotherapists indicates that VBI is rare and the majority of patients who present with dizziness do not suffer from VBI (Clements, 2001). Although only anecdotal, this observation may change the perspective on this condition. Some distinction between dizziness/vertigo related to VBI and that from other sources is possible within a clinical examination. Multiple sensory systems contribute to the body’s balance function (Shepard and Telian, 1996). The central nervous system is responsible for integration and modulation of the information required for balance and if integration of input from the different sources is disrupted, symptoms of disequilibrium may develop. In a pathological situation, visual, vestibular or neurological disease may alter the perception of motion and the environment, as the sensory inputs no longer match those anticipated (Luxon, 1997).

Vertebro-basilar insufficiency is evidenced by symptoms of ischaemia of the areas of the brain supplied by the basilar artery—the pons, medulla and cerebellum, in addition to the central and peripheral vestibular system. When investigating clinical features in 84 subjects with vascular origin vertigo, Grad and Baloh (1989) (cited by Clendaniel, 2000) found that vertigo may be an initial isolated symptom of VBI, but its presence without other symptoms associated with posterior circulation ischaemia for greater than 6 months would imply a different cause. Other symptoms are those traditionally screened for in the subjective examination: visual hallucinations (spots in front of the eyes), drop attacks, dysarthria, dysphagia, visual field defects (narrowing of the visual

<table>
<thead>
<tr>
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<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weingart &amp; Bischoff (1992)</td>
<td>Cw Doppler US Flow velocity at C1 in various positions of rotation &amp; extension</td>
<td>30 normal volunteers</td>
<td>No significant changes</td>
</tr>
<tr>
<td>Thiel et al. (1994)</td>
<td>Duplex US Flow velocity during sustained (30 sec) extension, rotation &amp; combined extension/rotation</td>
<td>30 control volunteers 12 patients with symptoms &amp;/or signs of VBI on clinical testing</td>
<td>No abnormal flow patterns No meaningful significant differences in mean velocity ratios</td>
</tr>
<tr>
<td>Côté et al. (1996) Secondary analysis of data from Thiel et al. (1994)</td>
<td>Duplex US VA flow during extension/rotation testing</td>
<td>30 control volunteers 12 patients with symptoms &amp;/or signs of VBI on clinical testing</td>
<td>For increased impedance to flow: Sensitivity 0% Specificity 67–90%</td>
</tr>
<tr>
<td>Licht et al (1998, 1999)</td>
<td>Colour duplex US Contraleral &amp; ipsilateral rotation (45° &amp; end-range) on peak flow velocity</td>
<td>20 healthy university students</td>
<td>Both test positions: Significant but modest decrease with contralateral rotation Significant increase with ipsilateral rotation Volume flow data demonstrated no change, therefore hindbrain perfusion unaffected</td>
</tr>
<tr>
<td>Haynes &amp; Milne (2000)</td>
<td>Colour duplex US Peak systolic &amp; end diastolic flow velocities at 10° increments of contralateral rotation</td>
<td>20 patients (39 VAs) with neck-related symptoms</td>
<td>No significant change in group mean flow velocity Marked changes in flow velocities in 7 VAs toward end-range rotation</td>
</tr>
<tr>
<td>Licht et al. (2000)</td>
<td>Colour duplex US Peak &amp; mean flow velocities at 45° rotation, end-range rotation &amp; rotation/extension</td>
<td>15 patients with positive pre-manipulative test response</td>
<td>No significant change in flow velocities of contralateral or ipsilateral arteries in any test position</td>
</tr>
</tbody>
</table>

CW = continuous wave; US = ultrasound; VA = vertebral artery; VBI = vertebro-basilar insufficiency.
Benign Paroxysmal Positional Vertigo (BPPV) is the most common cause of vertigo of peripheral origin and is more common than vertigo of central origin (Brandt and Daroff, 1980; Herdman, 1997; van der Velde, 1999). BPPV is characterized by brief intense, but often severe, rotational vertigo when the head is moved into particular positions. These movements typically include rolling onto one side in bed, lying down or getting up from supine, looking or reaching upwards, turning the head into the combined position of extension/rotation such as when reversing the car, with reversal of the provoking movement causing a reversal in the nystagmus and recurrence of the vertigo (Brandt & Daroff, 1980; Herdman, 1997; Van Der Velde, 1999; Herman and Tusa, 2000). Symptoms such as postural instability, generalized disequilibrium, unsteadiness of gait, sensitivity to head movements and falls may also be reported.

There are two postulated causes of BPPV, with the most common being canalithiasis, where degenerative debris from the utricle floats freely within the endolymph of, most commonly, the posterior semi-circular canal. When the head is moved into a provoking position, the otoconia (debris) move, as a result of gravity, to the most dependent position in the semi-circular canal, causing movement within the endolymph which pulls on the cupula, causing the neurons to fire. The typical delay in onset of symptoms relates to the time required for deflection of the cupula by the endolymph, the characteristic nystagmus is caused by the relative deflection of the cupula and the fatigue of the symptoms occurs because the endolymph stops moving when the position is sustained (Herman and Tusa, 2000). BPPV occurs spontaneously but may also follow a bout of labyrinthitis or head trauma, such as whiplash or head injury.

Cervical vertigo or dizziness has also been described, but its mechanisms remain controversial (Clendaniel, 2000). Symptoms typically associated with cervical dizziness appear related more to altered balance than oculomotor or vestibular function. Typical presentation includes dysequilibrium or light-headedness, ataxia or unsteadiness combined with cervical pain and restricted movements, with symptoms provoked by movements of the head, in no particular direction. However, other disease processes can present with similar symptoms. At present, since there is no definitive test for cervical dizziness, the presence of cervical signs on examination and prompt favourable response to their treatment would appear the optimal initial differential diagnostic pathway. Failure to respond to cervical treatment suggests referral for investigation of vestibular or neurological function would be appropriate.

Vertigo from VBI may resemble BPPV. The key features of each are provided in Table 3. Physical diagnosis of BPPV involves a series of provocative positioning and movement tests, part of which is not dissimilar to those used for VBI testing. If VBI testing of cervical rotation/extension undertaken in supine appears positive, BPPV may be the cause as the position is similar to the final stage of the Dix–Hallpike test (Herman and Tusa, 2000). VBI testing should be repeated in sitting, particularly with hips in flexion, so that the final cervical position is the same but the head remains in a vertical position, thus preventing the sympotms of BPPV, which are provoked by changes in head position relative to gravity (Clendaniel, 2000).

Other causes of vertigo and nystagmus should also be considered in differential diagnosis and the presence of other background conditions may also facilitate differentiation: ear disease, cardiovascular disease, migraine, epilepsy, stroke, head injury or a family history of BPPV may provide clues to the current presenting disorder. These cues may be helpful during examination to determine the source of vertigo, thus facilitating decisions related to the safety of cervical manipulation. The revised guidelines enable the physiotherapist the latitude to evaluate the most likely cause for the presenting ‘dizziness’ symptoms based on clinical reasoning and guided by the above research. However, if a physiotherapist is unsure of a diagnosis related to dizziness of VBI, BPPV or other origin, referral to an otolaryngologist, neurologist or vestibular rehabilitation physiotherapist is recommended.

4.3. Provision of information and gaining consent

The rate of compliance of provision of information and obtaining consent was poor overall. The fact that fewer than half the respondents complied with this component of the protocol and that such strong opinion was expressed against obtaining consent is of great concern. There are clear legal arguments stating that provision of information and obtaining consent from a patient prior to use of techniques over which the patient has no control and which potentially involve a degree of risk is no longer a recommendation but law (for example, Dunn, 1993; Parry, 1994; Delany, 1996; Haswell, 1996; Sim, 1996). There has been extensive comment in both the popular and legal press about the implications for the health professions of the Rogers v Whitaker (1992) judgement (for example, McSherry, 1993; Nisselle, 1993; Balding, 1995; Grant, 1996a,b, 2002; Nagree, 1997), supporting the need to develop a new protocol that can be applied appropriately and consistently by all.

In addition to the legal requirement, the emphasis of care within musculoskeletal physiotherapy now includes the patient more in decision making (Gifford, 1998;
As this process has been shown to enhance patient response to management (Strong, 1995). The comment that requesting the patient’s consent to manipulate their neck would mean fewer patients agreeing to the technique fails to reflect this changing philosophy within health care generally. Health professionals have both an ethical and legal obligation to provide information and gain consent for techniques such as cervical manipulation. Failure to provide the opportunity for consent undermines the moral principle of respect for an individual’s essential human dignity (Sim, 1996). A suit for assault or battery may be brought by a patient against a health practitioner, significantly, with no need to show actual physical harm (Dimond, 1995)—battery if the patient is touched, assault where the patient fears they will be touched.

Under the tort of negligence, if a breach of duty of care can be proved, with the direct result that the patient undergoes some foreseeable harm, negligence on the part of the therapist is said to have occurred (Brazier, 1992). A duty of care covers the provision of information and obtaining consent as well as the treatment itself. Therefore, providing information and gaining consent for cervical manipulation protects the therapist from legal action in addition to respecting the patient’s right to self-determination.

In law, consent takes different forms. ‘Express consent’ occurs when an individual explicitly indicates agreement, either orally or in writing; ‘implied consent’ occurs when an individual does not specifically indicate agreement but performs some action that suggests consent, such as following instructions prior to administration of any particular procedure; and ‘tacit’ consent is where consent is inferred from the patient’s failure to dissent (Sim, 1996).

Express consent is considered essential prior to techniques over which the patient has no control, such as cervical manipulation and should be re-established prior to every individual manipulative technique. Implied or tacit consent is sufficient for the majority of physiotherapy procedures. Informed consent is a form of express consent and has been defined as ‘the voluntary and revocable agreement of a competent individual to participate in a therapeutic or research procedure, based on an adequate understanding of its nature, purpose, and implications’ (Sim, 1996).

The judgement made in Rogers v Whitaker (1992) changed the view of the courts from one where mistakes were accepted as part of the risk inherent in medical treatment, to one where failure to provide information and warnings about treatment was no longer ‘misadventure’ but negligence (Delany, 1996). The key feature in this case was that the court decided what

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**Table 3**

Differentiating BPPV from VBI (Based on Davies, 1997; van der Velde, 1999; Clendaniel, 2002)

<table>
<thead>
<tr>
<th>BPPV</th>
<th>VBI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head vs. neck position</strong></td>
<td><strong>Relative head movement while neck immobile</strong></td>
</tr>
<tr>
<td>used to elicit vertigo and nystagmus</td>
<td>Sustained cervical or head posture</td>
</tr>
<tr>
<td><strong>Latency</strong></td>
<td>Abrupt in onset and of short duration (several minutes)</td>
</tr>
<tr>
<td><strong>Nystagmus behaviour</strong></td>
<td>Continuation of nystagmus with maintenance of position</td>
</tr>
<tr>
<td><strong>Pattern of nystagmus</strong></td>
<td>Usually vertical</td>
</tr>
<tr>
<td><strong>Fatiguability</strong></td>
<td>Intensity of vertigo increases with continued testing</td>
</tr>
<tr>
<td><strong>Additional symptoms/signs</strong></td>
<td>Disturbances in vision Dysarthria</td>
</tr>
<tr>
<td>Postural instability</td>
<td>Diplopia Hemiparesis/hemiplegia</td>
</tr>
<tr>
<td>Disequilibrium</td>
<td>Nausea/vomiting Drop attacks</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>Ataxia</td>
</tr>
</tbody>
</table>

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**Harding, 1998**, as this process has been shown to enhance patient response to management (Strong, 1995). The comment that requesting the patient’s consent to manipulate their neck would mean fewer patients agreeing to the technique fails to reflect this changing philosophy within health care generally.

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was acceptable and reasonable, not the profession. ‘The
general legal principle which underpins the (Rogers and
Whitaker) finding is one which asserts that the
paramount consideration is that a person is entitled
to make decisions about his or her own life, and the
duty to disclose the information takes its precise
content from the needs, concerns and circumstances of
the patient’ (Retsas and Forrester, 1995, cited by
Delany, 1996). Since this judgement, medico-legal
practitioners have urged the health professions, including
physiotherapy, to change their practice in this
area (Delany, 1996; Haswell, 1996; Kee, 1996; Nagree,
1997).

A survey of APA members (Grant and Trott, 1991;
Grant, 1996a,b), a straw poll conducted by Delany
(1996) and the present survey all reported poor
compliance among physiotherapists with the require-
ment to provide information and obtain consent prior to
cervical manipulation. Text responses to the MPA
survey demonstrated strong opinion by some respond-
ents that this requirement was inappropriate. Such an
approach to patient information and consent is not
acceptable in law (Delany, 1996).

Expert medico-legal advice was sought prior to
development of the new clinical guidelines. The key
feature of this advice was that the health practitioner
was required to provide adequate information to the
patient concerning the procedure for the patient to be
able to make a judgement about the choices offered.
Such information must include the benefits and risks
associated with the procedure and alternatives to that
procedure, together with their benefits and risks. The
information must be provided in a form that the patient
can understand. In addition, the health practitioner
must provide the patient with the opportunity to ask
questions about the procedure and to have those
questions answered to their satisfaction prior to the
request for consent. Such information may be provided
in a brochure format but without adequate face to face
follow-up, a brochure does not fulfil the legal require-
ment.

It is acknowledged that this process is time-consum-
ing, but the negative impact must be weighed against the
potential consequences of litigation should the process
not be followed. Such a process is also considered
essential to patient involvement in decision making
related to their management.

The need to inform the patient of the potential risk of
death associated with cervical manipulation was also
addressed. While accepting that there has been no legal
precedent to help the decision process, the legal opinion
was that, on available evidence from the literature and
the results of the current survey, there was no need to
inform the patient routinely of the risk of death. The
consideration was that, if the risk is lower than those
taken as part of normal daily life, it fails to constitute a

5. Clinical guidelines for pre-manipulative procedures for
the cervical spine

The new Clinical Guidelines differ substantially from
the APA Pre-Manipulative Protocol. The somewhat
rigid format of the protocol has been modified to allow a
degree of clinical reasoning in patient examination and
management. In all other aspects of manipulative/
musculoskeletal physiotherapy, clinical reasoning is
strongly emphasized. A set of Clinical Guidelines rather
than a formal protocol more appropriately reflects
current practice of manipulative/musculoskeletal phy-
siotherapy within Australia. The final document, while
providing guidelines to clinical practice, leaves the
ultimate decision on appropriate action to the therapist
in the context of any particular individual patient
presentation.

The specific changes within the new guidelines from
the previous Protocol include:

- Inclusion of an introductory explanatory preamble.
  This preamble includes mention of the provocative
  nature of the test procedures; mixed results from
  research in relation to alteration of blood flow within
  the vertebro-basilar system (Rivett et al., 1999;
Johnson et al., 2000; Zaina et al., 2003); that indicative factors appear to include trauma and/or neurological changes (Haldeman et al., 1999) and that there is no known method for testing the intrinsic anatomy of the vertebral artery. The screening tests will not identify all patients at risk of suffering an adverse reaction to manipulation.

- Inclusion of nausea within routine screening; inclusion of a range of symptoms that have been reported as associated with vertebro-basilar insufficiency (VBI) or vertebral artery dissection. Also included are differentiating features related to these symptoms to facilitate distinction of VBI related symptoms from those related to vestibular disorders or BPPV (Davies, 1997; van der Velde, 1999). In addition, the emphasis on the importance of the subjective screening is raised.

- Inclusion of routine questioning about provocation of VBI related symptoms during standard physical testing of the cervical spine of any patient. For patients who report provocation of VBI related symptoms, reduction of the specific requirements in the physical examination section. Minimum testing recommended now includes sustained end-range rotation only, performed either in supine or sitting, with the actual testing procedure unchanged from the previous protocol. Additional testing procedures are suggested but are not required by the guidelines, other than routine questioning during examination of active movements for the provocation of VBI related symptoms. Inclusion of additional testing procedures should be guided by the clinical reasoning of the physiotherapist in the context of any particular patient presentation.

The mandate was to reduce the protocol in length, but to base this reduction on research evidence. As discussed, the research is inconclusive in determining the most valid screening test. However, given that a change in blood flow related to rotation was detected in the majority of studies and that the present survey highlighted more incidents related to rotation than any other movement, sustained rotation was reasoned to be the most appropriate test to include as mandatory.

- Inclusion of a specific section outlining recommendations for assessment during and following treatment and interpretation of the results of the examination procedures. The specific recommendations are that if there is evidence of symptoms potentially associated with VBI from both the subjective and physical components of the examination, cervical manipulation or high velocity thrust techniques (HVTT) or end-range rotation techniques (ERRT) should not be undertaken. Also, if there is evidence at any time that symptoms are clearly associated with VBI, HVTT or ERRT should not be undertaken. In all other situations, the final decision depends on the therapist’s reasoning in any particular patient presentation.

- Inclusion of a substantially revised section on provision of information and obtaining consent for cervical manipulation (HVT techniques). This section includes essential information to be provided to any patient prior to undertaking cervical manipulation. Differences in types of consent as recognized in law are included to assist physiotherapists to determine the situations in which consent should be gained. Guidelines for gaining consent from patients for cervical manipulation (HVT) and recording that consent are also included (Fig. 5). A flow chart of the processes to be followed during examination of a patient with cervical symptoms is provided (Fig. 2).

6. Conclusion

This study suggests that the use and interpretation of the APA Protocol for Pre-Manipulative Testing of the Cervical Spine (APA, 1988) is variable among members of MPA. There is a need to continue with definitive investigations regarding the appropriateness, sensitivity and specificity of the protocol in detecting patients at risk of complications from manipulative/musculoskeletal physiotherapy techniques and the effect of cervical movement on vertebral artery blood flow. This research is ongoing (Rivett et al., 1999; Johnson et al., 2000; Grant, 2002; Zaina et al., 2003).

The risk of complication from physiotherapy practice, including HVT techniques, appears to be low and none of the reported incidents in this study involved serious or permanent compromise to the vertebro-basilar system. A large number of the reported minor incidents were elicited by examination procedures involving rotation, including those related to the protocol, rather than manipulative physiotherapy treatment, arguably supporting the value of the protocol as a screening tool.

While the new guidelines will never satisfy all members of the profession, the majority of the feedback has been positive. The principal criticism relates to the informed consent section, with some members resentful of the apparent imposition of this requirement. In reality, the imposition has come from the changing perception of the individual’s place and rights in society rather than the profession and the guidelines have been developed to protect physiotherapists in addition to their patients. Most MPA members providing informal feedback appreciate the relative freedom allowed in the new guidelines to make their own decisions.
Fig. 2. Flow chart for examination of the cervical spine using guidelines for pre-manipulative testing of the cervical spine.

References


Grant R, Trott P. Pre-manipulative testing of the cervical spine—the APA protocol three years on. Proceedings of the 7th Biennial Conference Manipulative Physiotherapists Association of Australia, Blue Mountain’s, NSW, 1991.


