

Opinion

Life-Changing Bubbles: A Simple Solution That May Help ManyDavid G Smithard ^{1,*}, John Mirams ²

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Received: February 20, 2023**Accepted:** August 17, 2023**Published:** August 24, 2023**Abstract**

As the medical world continues to search for ways of improving the swallowing of many millions of Dysphagia sufferers around the world, this paper is devoted to presenting the case for carbonated water to be considered as a potential solution for many. The effectiveness of carbonated water (CW) in the rehabilitation of Dysphagia has been studied periodically over the last thirty years and some significant positive results have been recorded – but it is now proposed that further research should be directed to examine the outcomes from its use by cohorts of individual patients with a similar source of their swallowing problems and with different mental or physical conditions, within different age groups.

Keywords

Dysphagia; carbonated water; personal experience



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1. The Medical Perspective

1.1 Introduction

The ability to eat and drink safely is an important factor in our general physical and mental well-being. Having difficulty swallowing can have a major impact on a person's life resulting in malnutrition, risk of chest infection and social isolation. It is important, therefore, to support people with swallowing difficulties to maintain the nutrition, minimize their risk of infection and maintain their place in society.

Swallowing impairment is a worldwide problem that affects all age groups. The prevalence in adults varies between populations and is particularly high in the context of brain disease (Stroke, dementia, traumatic brain injury) [1, 2], The prevalence varies with age; for example, in children between 1 and 26% [1, 3]; older adults 0.5-34% [4-8]. Rajati et al. in their systematic review estimated global prevalence to be 43.8% [9].

On this basis, it means that there are some 590 million sufferers worldwide, and it is estimated that in the UK, at least 2 million (perhaps up to 3.9 million) dysphagia sufferers are living at home, some 430,000 are residents in Care Homes, and that every day, there may be 100,000 or more in-patients in hospitals across the country with some form of dysphagia.

Swallowing impairments are more common where people have an underlying medical problem, commonly, but not exclusively, neurological (Stroke, head injury, dementia, Parkinson's disease) or structural (Congenital, head and neck cancer) [5-9].

1.2 Current Management Approaches

The management of swallowing problems can be difficult. The initial approach is by means of a clinical assessment, usually by a speech and language therapist/pathologist followed by videofluoroscopy or fiberoptic endoscopic evaluation of swallowing (or occasionally both). Management strategies focus on the ability to eat and drink safely and eat enough to keep body and soul together which may include the use of postural techniques and modified diets [10, 11]. Rehabilitation [12], of the ability to swallow is a fertile research field with many avenues being explored including strength training [13] the use of restraint (Laryngeal restriction) [14], chin tuck exercises [15-17], tongue strengthening exercises [18, 19], swallowing exercises [20] or pharyngeal [21] and brain stimulation [22].

1.3 Carbonated Water: Findings of Earlier Research

Research over the last 20 years has shown mixed results as to the benefit of CW in the management of dysphagia. Early studies by Ding et al. [23] in 2003 involving healthy adults did not show any benefit, whereas more recently the use of CW resulted in an increase in suprahyoid activity (as recorded by EMG) [24], greater rising and releasing of linguapalatal pressures [25], longer UES relaxation time [26] and faster and stronger swallow [27]. In 2003 Bülow et al. [28] reported that the use of carbonated thin liquids reduced penetration/aspiration into the airway people with neurological disease. This was confirmed in a later study involving people with Lewy body dementia and dementia associated with Parkinson's disease [29].

CW has been shown to increase swallowing safety, often by speeding up the swallow [30]. Recent hypotheses have suggested that the CW works mainly via effect of chemoreceptors, taste and smell and subsequently cortical structures [31]. Carbonation may act via chemesthesis increasing the chemical sensation, particularly with in the oral cavity, with stinging/irritation from the carbon dioxide, via the formation of carbonic acid in the oral mucosa [32], this leads to the postulation that capsaicin sensitive nerves (and hence substance P) [33] may be involved. An alternative proposal is that chemesthesis is mediated through the same nerves and pathways as texture and proprioception [34, 35]. Intensive use of CW may demonstrate tachyphylaxis [34]. Therefore, is CW stimulating the feedback loop and possibly cortical neuroplasticity or is it all a local effect?

The type of carbonated drink to use is probably of no consequence from a physiological point of view, however, older adults may prefer sweeter drinks [30]. Higher carbonated drinks may have a greater effect on swallowing, but a lower palatability suggesting a compromise between taste and effect will be required [36].

The consensus is that CW has a beneficial effect on the swallow and improves the safety of the swallow even if there are no direct demonstrable specific physiological changes [37-39].

2. A Personal Experience

2.1 Background

JM (a 90-year-old retired businessman) developed dysphagia as a result of throat cancer and osteoradionecrosis (non-Hodgkin's lymphoma treated with radiotherapy) some 60 years ago, resulting in the eventual loss of my teeth, hearing and balance. My dysphagia has had a major, often daily and sometimes embarrassing, impact on my eating and consequently my social activities over the years, involving:

- Regular choking fits, which normally required a visit to the bathroom, lasting perhaps five minutes or more.
- On many occasions, some food or drink being discharged through the nose.
- For many months, coughing, choking or sneezing caused minor nosebleeds, mainly from the right nostril only, or sometimes a full-scale bleed.
- Having a full set of dentures became an increasing hazard, with a tendency for some foods to cling tightly to the upper palate and with the lower set being dislodged. Ever since, I have had a real fear of swallowing the lower denture completely, during a major coughing or choking episode.
- Social activity was obviously hazardous, and matters came to a head in 2012 during a smart Club Dinner with some 40 other guests, when I choked and deposited a mouthful of food and drink and a lot of blood over one of the tables and two unfortunate diners!

Apart from such dramatic occasions, the whole process of eating had become a tiresome and boring activity, and as a result I lost about approximately 6.5 kg in weight, and it put an end to almost all social activity. I avoided all events, business meetings or social gatherings that might involve refreshments of any kind.

At the age of 86, after about twenty years of constantly clearing my throat, coughing and choking throughout all meals and snacks, my granddaughter suggested I should try drinking some of her sparkling water to ease the problem. It turned out to be a life-changing moment!

I obtained a small domestic carbonation device, and the results were extraordinary. About five months later, after countless hours of experimentation, success and failure, I was enjoying eating once again, I had regained the lost kilograms in weight and my long-suffering family was much relieved!

As a bonus, my frequent bouts of indigestion and constipation had almost entirely disappeared.

For me, the case for carbonated water as a treatment for the eating problems of dysphagia was by then already proven! – although I realised that further research and experimentation were obviously essential.

2.2 The Results and Findings from Personal Experimentation

I have been using CW every day for the last two years, as part of my diet throughout the day, to ensure that eating remains an effective and pleasurable exercise, and to continue the examination of swallowing problems and solutions related to dysphagia.

I have only used CW made by me from tap water with no additives, for there is no question that, for me, other sparkling drinks such as Colas, etc. are not suitable – they are more difficult when taken as a drink, and are not as effective in helping the swallowing process.

I have been happily eating many different foods and dishes over these months: stews, casseroles, soups, cold meats, quiches, porridge, fruit, yoghurts, some biscuits and some chocolate – and during this period of experimentation, the number of coughing and choking incidents progressively reduced substantially.

I am delighted to report that although I still have occasional short coughs, I have had no choking event for the last ten months.

2.3 My Main Findings Are:

1. The primary and most crucial reason for using CW is not, as many initially assume, to wash a bolus down the throat, but for me, it is to remove the saliva and any remaining debris from the mouth, cavity and throat – in order to clear the route for the arrival of the next mouthful of food. CW taken in small quantities can of course help to remove a bolus, but taking too much CW with a mouthful of food will inevitably cause severe choking.
2. The texture of the food to be swallowed is of course crucial, and whilst its softness and viscosity are fundamental, I have found that it is also essential to consider the qualities in terms of its 'clagginess', 'crunchability' and 'chewability'.

The 'clagginess' ('stickiness' or 'tackiness') of the food in the mouth, or as a bolus in the oral cavity, is the single most important quality, which varies within broad types of product and between different brands. For example, porridge made with large flakes is less claggy than porridge made with normal or standard sized flakes, and the clagginess can even vary between two different brands of the larger flakes.

The 'clagginess' of a food can of course be changed when in the mouth, by sipping CW or by adding CW or some other liquids to the food (e.g., pureed fruit with porridge) – but it can also be reduced by adding other suitably 'crunchable' foods in the right quantity, such as certain types and brands of crisps and biscuits.

Some selected food items, when crunched by the teeth, break down into consistently uniform small pieces, making them easier to swallow immediately in that form or to coalesce conveniently with other 'claggy' foods in the mouth.

For example, soft cheeses, etc. can be made less 'claggy' by putting a 'crunchable' crisp into the mouth actually with the cheese, or immediately after it. So far, I have found two brands of crisp with the right texture, where the potato is cut in a 'furrows' or 'ridge-cut' form that makes them more easily crunchable than most other crisps.

When the taste of a food is especially important, such as with my favourite Lemon Sole, I chew that alone for some seconds, and then add the crisp to be crunched with it just before swallowing!

'Chewability' of course depends on the effectiveness of teeth, natural or false, but I have avoided most of the 'High Risk' foods as listed on the Web (e.g. ref: ruh.nhs.uk) – especially vegetable and fruit skins, most tough meats, most fresh breads, most crisps, all nuts, dried fruits, many cereals, mueslis and many biscuits.

3. I have kept all mouthfuls small, with pieces of food (chicken, fish, fruit, etc.) being no bigger than about 10 mm, square or in diameter.
4. I have found that eating without coughing or choking requires careful planning, and continuous concentration. Apart from the careful choice of menu and foods as mentioned above, I have tried to follow some basic rules, on the following lines:
 - Ideally, meals should be taken alone, or with relations or friends who understand the situation, so that free-flowing conversation can be avoided.
 - Meals should be timed to avoid losing concentration – caused by sudden interruptions from children or pets, or by any other distractions, even from unexpectedly dramatic and noisy television programmes. Phones and doorbells should be left to ring unanswered.
 - Any sudden movement of the head, blowing the nose or standing up, should be avoided at all times while food or drink are in the mouth, waiting to be swallowed.
 - The position of the head during the eating process may be effective in completing a swallow. (I have found that to drop my chin by 20 or 30 mm, with a small twist of the head to the right at the crucial moment of swallow, can be very beneficial.)
 - A swallow of CW is the perfect preparation for the taking of medicines and especially for swallowing small pills, such as the 75 mg aspirin.
 - I have avoided drinking CW within half an hour of going to bed, for I have found that it can encourage reflux activity later on.
5. In practical terms, I have found it essential to always have access to a supply of CW in small 150 ml or 300 ml glass bottles, with tight screw tops, ideally chilled from the fridge, for use wherever I am during the day. At the moment, I manually decant my CW from a small domestic device, but I can confirm that equipment already exists to produce CW on-line at home, or if the needed in future, to provide larger volumes each day for residents in Care Homes or for patients in hospital.

2.4 Summary

The use of carbonated water as described above has been a wonderful and life-changing experience for me, and I am convinced that it can be for many others too, depending on their individual condition and circumstances, if they are prepared to devote many hours, initially and

perhaps for some months, to personally experimenting with different foods that they like, to trying different techniques in food preparation, and to concentrate continuously on a process of eating and drinking that suits their personal needs and circumstances.

3. Suggested Way Forward

CW in the form of proprietary soft drinks is readily available and can be purchased at many retail outlets. People are also able to purchase devices to make their own “fizzy” water cheaply. With the evidence base as it is, it is reasonable for clinicians to suggest to some of their patients that CW may benefit them and aid their swallow.

Present research has focussed on the physiology of swallowing and swallowing dynamics. Many studies have focussed on physiological outcomes (PAS, PTT), whilst at the same time paying little attention to a socially acceptable swallow and improved quality of life.

Systematic literature reviews [39-42] have been supportive that CW can have a positive and beneficial effect on swallowing, and that CW should be included in the speech and language therapists tool kit. All reviews conclude that presently there is not enough scientific evidence to be certain as to who would gain most benefit from CW [41], It can be surmised from the personal experience of JM and the literature, people with neurological dysphagia and those with thick secretions may have the most to benefit.

Future research should focus on understanding who is likely to benefit from the use of CW (age, aetiology of swallowing impairment, severity of impairment) and whether there should be a standardised preparation of CW [43] that should be approved and regulated by food standard agencies or medicine regulators.

The swallowing community, across the globe, should take a coordinated approach in any future research.

- The CW product to be used for all research is specified as follows:
- A minimum dataset of clinical outcomes needs to be agreed and should include:
 - o A measure of functional oral intake (e.g. FOIS)
 - o Quality of life (e.g. SwalQol/SF36)
 - o Mental well-being (e.g. a depression score or a well-being scale).
 - o A measure of sputum viscosity.
- A research network of clinicians who will take part in requisite studies.
- Undertake a series of studies:
 - o Cohort studies
 - o Randomised control studies focussing on specific disease areas (e.g. stroke; head and neck cancer; Parkinson’s disease)
 - o N = 1 studies (collated on a Worldwide data base)

4. Conclusion

Swallowing impairment is an unrecognised problem for society (financially, days lost from work) and individually from under-nutrition and dehydration, and this in turn will result in the risk of falls, loss of mobility, infection, skin breakdown and ultimately death.

Case histories and research suggest that CW has the potential to benefit many people with swallowing impairments. It is estimated that 590 million people around the world have some form

of swallowing impairment, consequently there is the potential for the use of CW to have a major positive impact on many peoples' lives.

Researchers either individually or via their professional groups (e.g. DRS, ESSD, RCSLT, JDRS) must demand that future research has patient-focussed outcome measures, and be commissioned via research bodies (e.g. European Union, National Institutes for Health (USA), National Institute for Health and Social Research (UK)), to answer the question whether the use of CW has clinical, social and economic benefit.

What a legacy that would be!

Author Contributions

DGS and JM contributed equally to the paper. JM made the initial suggestion regarding the benefit of CW specifically contributed the personal experience; reviewed various drafts making suggestions and agreeing the final manuscript. DGS, together with JM formulated the idea for the paper, the introduction, summary, way forward and conclusion. Reviewed and edited the paper.

Competing Interests

The authors have declared that no competing interests exist.

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