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Virechana Karma and The Microbiota- Gut-Brain Axis: A Probable Mechanism in Neurological Disorders

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Abstract:
Virechana Karma is one of the principal Shodhana procedures of Ayurveda and is primarily indicated for the elimination of aggravated Pitta Dosha. However, its therapeutic application is not restricted to Pitta disorders. Classical Ayurvedic texts describe Mridu Virechana and Snigdha Virechana in several Vataroga, including conditions involving Pakvashaya and abnormal movement of Vata. The gastrointestinal tract occupies an important position in the pathogenesis and management of Vata disorders, while contemporary research has established a complex bidirectional communication between the gastrointestinal tract and the nervous system through the microbiota–gut–brain axis. Alterations in gut microbial composition have been associated with several neurological disorders, including stroke, Parkinson's disease, Alzheimer's disease and neuropsychiatric conditions. Gastrointestinal complications, particularly constipation, are also frequently observed in neurological disorders and may adversely influence recovery. Virechana directly acts upon the gastrointestinal tract and may influence bowel function and intestinal microbial composition. Available studies have reported alterations in gut flora following Virechana and bowel cleansing. The present review explores the classical basis of Virechana in Vataroga and examines its probable relationship with the microbiota–gut–brain axis. The proposed mechanism suggests that appropriately administered Virechana may contribute to Vatanulomana, management of associated Dosha, improvement of gastrointestinal function and modulation of the intestinal microbial environment, thereby potentially influencing gut–brain communication. However, the proposed relationship remains a hypothesis and requires further clinical and experimental validation.

Keywords: Virechana, Vataroga, Panchakarma, Pakvashaya, gut microbiota, microbiota–gut–brain axis, neurological disorders, Snigdha Virechana, Mridu Virechana.

INTRODUCTION

Panchakarma occupies an important position among the therapeutic procedures of Ayurveda and is primarily intended for the elimination of aggravated Dosha from the body. Virechana Karma is one of the principal Shodhana procedures and is predominantly associated with the elimination of aggravated Pitta Dosha. Classical Ayurvedic literature, however, describes its application in several conditions in which Vata is involved, particularly when Vata is associated with other Dosha or when its normal movement is disturbed. Virechana is described in conditions such as Udavarta, Timira and other disorders associated with Pratiloma Gati of Vata[1].

The application of Virechana in Vataroga is particularly significant because Vata is considered to have a close relationship with Pakvashaya. Mridu Virechana, also described as Snigdha Virechana, is recommended in Vataroga where Vata predominates and associated Dosha are involved. Such therapy is considered capable of supporting Vatanulomana, pacifying Vata and eliminating associated Dosha[2]. Snigdha Virechana is also described in the management of Apatanaka and Bahirayama[3]. Virechana is further indicated in conditions where Vata is aggravated in Rakta, Mamsa, Meda and Sukra Marga, while the presence of Kapha in Pakvashaya is also described as an indication for Virechana[4,5].

Snigdha Virechana is specifically described in Pakvashayagata Vata[6]. The classical concept that Pakvashaya is the principal site or root of Vata provides an important foundation for understanding the use of gastrointestinal interventions in Vataroga[7]. In conditions where Vata is obstructed by faecal matter, Snigdha Anulomana using Eranda Taila is also described[8].

Clinical studies reported in the available Ayurvedic literature have evaluated the role of Virechana in Pakshaghata. Virechana followed by Shamana therapy has been associated with improvement in motor function, muscle power, exaggerated reflexes and muscle tone in patients with post-cerebrovascular Pakshaghata[9]. Another clinical study reported improvement in finger movement, arm lifting, wrist movement, muscle strength, handgrip and walking following Virechana and Shamana therapy[10]. Virechana Karma has also been reported to improve quality of life and reduce speech slurring in comparison with Kala Basti[11]. Snehayukta Virechana has been reported to provide improvement in pain, ability to sit and stand, speech, muscle tone and muscle power in patients of Pakshaghata[12].

These classical descriptions and clinical observations raise an important question regarding the possible biological pathways through which a gastrointestinal Shodhana procedure may influence neurological function.

One such possibility is the microbiota–gut–brain axis.

MICROBIOTA–GUT–BRAIN AXIS AND NEUROLOGICAL FUNCTION

The gastrointestinal tract and central nervous system are interconnected through a complex bidirectional communication system involving neural, endocrine, immune and microbial pathways. This interconnected system is commonly described as the microbiota–gut–brain axis. The intestinal microbiota participates in the regulation of gastrointestinal physiology as well as several neurological and behavioural functions.

Alterations in the composition and metabolic activity of intestinal microbiota have been associated with neurological disorders and neuropsychiatric conditions. These include autism spectrum disorders, attention deficit-hyperactivity disorder, Parkinson's disease, Alzheimer's disease, stroke, epilepsy, multiple sclerosis and depression[13].

The relationship between the gut microbiota and nervous system is not restricted to structural communication. Microbial activity can influence neuroactive substances and signalling molecules involved in neurological regulation. Vasoactive intestinal peptide and brain-derived neurotrophic factor are among the mediators investigated in relation to gut–brain communication. Experimental evidence has demonstrated an association between altered gut microbiota and BDNF levels, while deficiency of vasoactive intestinal peptide has also been associated with alterations in gut microbial composition[14].

The communication is bidirectional. Alterations in the gut microbial environment may influence neurological function, while changes in neurological physiology can subsequently influence gastrointestinal function and microbial composition[15]. The intestinal microbiota also interacts with

pattern-recognition receptors and thereby participates in immune signalling associated with the development and function of both the central and enteric nervous systems[16].

Experimental studies have further demonstrated the potential influence of probiotics on behavioural manifestations. Administration of *Lactobacillus rhamnosus* GG was associated with attenuation of anxiety- and depression-related behaviour in experimental animals[17]. Beneficial psychological effects have also been reported following administration of a probiotic formulation containing *Lactobacillus helveticus* R0052 and *Bifidobacterium longum* R0175 in healthy human volunteers[18].

These observations indicate that the intestinal microbial environment may participate in neurological and psychological regulation and therefore provide a potential biological pathway through which gastrointestinal interventions may influence the nervous system.

MICROBIOTA AND STROKE

Stroke is associated with significant alterations in gastrointestinal and systemic physiology. Studies have demonstrated changes in gut microbial composition and reduced trimethylamine-N-oxide levels in patients with large-artery atherosclerotic stroke or transient ischemic attack[19].

The relationship between stroke and gut microbiota appears to be bidirectional. Acute brain injury can itself produce gut microbial dysbiosis, while the degree of dysbiosis may influence post-stroke immune responses and neurological outcomes[20].

This relationship becomes particularly relevant when considered alongside the Ayurvedic description of Pakshaghata and the use of Virechana in selected patients. Although the classical description and modern microbiological findings arise from different conceptual frameworks, both highlight the importance of gastrointestinal function in systemic and neurological disease.

MICROBIOTA AND PARKINSON'S DISEASE

Parkinson's disease provides another important example of the relationship between gastrointestinal function and neurological disease. Gut microbiota have been shown to contribute to motor deficits and neuroinflammation in experimental models of Parkinson's disease, while alterations in the human gut microbiome have been identified as a possible risk factor[21].

Altered communication between the intestinal microbiota and mucosal immune system has been associated with the development and exacerbation of Parkinson's disease[22]. Longitudinal studies have also demonstrated an association between characteristic changes in gut microbial composition and progression of Parkinson's disease[23].

A systematic review of gut bacterial profiles in Parkinson's disease further demonstrated the growing body of evidence linking microbial alterations with the disease[24].

The importance of this relationship is particularly evident because gastrointestinal manifestations such as constipation may precede or accompany neurological symptoms in Parkinson's disease. This raises the possibility that gastrointestinal physiology and neurological pathology may interact throughout the course of the disease.

MICROBIOTA IN AUTISM SPECTRUM DISORDER AND INTELLECTUAL DISABILITY

The gut microbiota has also been investigated in autism spectrum disorder and intellectual disability. Experimental research involving the KDM5 gene family has demonstrated an association between immune regulation, social behaviour and gut microbial alterations. In *Drosophila*, absence of KDM5

resulted in abnormal immune activation, altered social behaviour and gut dysbiosis. Modification of the gut microbiome using *Lactobacillus plantarum* L168 improved some of these manifestations[25].
Although such findings cannot directly establish the therapeutic role of Virechana in autism spectrum disorder or intellectual disability, they provide further evidence that the intestinal microbial environment can influence neurological and behavioural functions.

MICROBIOTA AND ALZHEIMER'S DISEASE

Age-related alterations in gut microbiota have been associated with gastrointestinal and neurological disorders, including dementia and Alzheimer's disease. Dysbiosis may influence the production of microbial products such as amyloid-related substances and lipopolysaccharides, which may affect gastrointestinal permeability, blood–brain barrier integrity and inflammatory signalling[26].
These mechanisms may contribute to neuroinflammation, neuronal injury and neuronal degeneration. The gut–brain axis therefore represents a potential area for understanding the relationship between gastrointestinal health and neurodegenerative disease.

GASTROINTESTINAL COMPLICATIONS IN NEUROLOGICAL DISORDERS

Gastrointestinal dysfunction is common in neurological diseases. Constipation is particularly important because impaired bowel function can interfere with general health, comfort, rehabilitation and quality of life.
In stroke patients, constipation has been reported as one of the common gastrointestinal complications. A systematic review and meta-analysis reported constipation in approximately 45% of patients during the acute stage and 48% during rehabilitation[27].
Patients with Alzheimer's disease have also been reported to have a higher incidence of serious upper and lower gastrointestinal events compared with individuals without Alzheimer's disease[28].
Parkinson's disease is frequently associated with gastrointestinal symptoms including dysphagia, constipation and defecatory dysfunction. Constipation may increase in both frequency and severity as the disease progresses[29]. Gastrointestinal dysautonomia has also been associated with reductions in dopamine transporter availability. Reduced bowel movements have been associated with changes in caudate dopamine transporter availability and may be related to nigrostriatal dopaminergic dysfunction[30].
These findings provide a contemporary basis for considering gastrointestinal health as an important component of neurological disease management.

ROLE OF VIRECHANA IN MODULATION OF GUT MICROBIOTA

The direct action of Virechana upon the gastrointestinal tract provides a possible connection between classical Shodhana therapy and the microbiota–gut–brain axis.
A clinical study investigating Virechana Karma and gut flora reported that the procedure reduced colonization by aerobic bacteria and helped correct gut flora dysbiosis[31]. This finding is of particular interest because it provides direct evidence for an association between an Ayurvedic Shodhana procedure and the intestinal microbial environment.
Evidence from contemporary bowel-cleansing research also demonstrates that therapeutic evacuation can produce measurable alterations in intestinal microbiota. Consumption of laxative preparations has been reported to increase the levels of Proteobacteria, Fusobacteria and bacteria related to *Dorea formicigenerans*[32].

The intestinal microbiota has an important role in digestion and metabolism. From the Ayurvedic perspective, Agni is responsible for digestion and metabolism, and proper functioning of Agni is associated with healthy gastrointestinal function.

The concept of Agni should not be equated directly with microbiota. Nevertheless, the relationship between digestion, intestinal microbial composition and metabolic activity provides an area in which Ayurvedic concepts may be investigated through contemporary biological methods.

VIRECHANA, AGNI AND SAMSARJANA KRAMA

The therapeutic effect of Virechana should not be considered independently of the post-procedure dietary regimen. Samsarjana Krama is prescribed after Virechana with the objective of gradually restoring and stabilizing Agni[33].

The progressive dietary modification following Shodhana is intended to support appropriate digestion and tolerance of food. Contemporary research indicates that dietary composition is an important determinant of intestinal microbial composition. Therefore, changes observed in gut microbiota following Virechana may potentially be influenced by both the Shodhana procedure and the subsequent dietary regimen.

The classical description of Samsarjana Krama therefore deserves consideration when investigating the microbiological effects of Virechana. The appropriate restoration of digestive function is an integral part of the therapeutic sequence rather than merely an optional dietary recommendation[34].

PROBABLE MECHANISM OF ACTION OF VIRECHANA THROUGH THE MICROBIOTA–GUT–BRAIN AXIS

The possible relationship between Virechana and neurological health may be understood through several interconnected mechanisms.

Virechana produces therapeutic evacuation of the gastrointestinal tract. This may alter intestinal contents, bowel movement and the local microbial environment. Modification of the intestinal microbial ecosystem may subsequently influence microbial metabolites, immune signalling and communication between the enteric and central nervous systems.

In Vataroga, appropriately selected Mridu or Snigdha Virechana may additionally facilitate Vatanulomana and pacification of Vata. The classical indication of Snigdha Virechana in conditions such as Apatanaka, Pakshaghata, Avarana Vata, Pakvashayagata Vata, Timira and Udavarta is particularly relevant to this discussion.

The microbiota–gut–brain axis provides a possible contemporary pathway linking these observations. Alterations in gut microbial composition can influence neurological processes through neural, immune, endocrine and metabolic mechanisms. Conversely, neurological disease may alter bowel motility, diet, autonomic activity and microbial composition.

Therefore, the probable sequence may be understood as:

Virechana → therapeutic gastrointestinal evacuation → modification of intestinal environment → possible modulation of gut microbiota → alteration of microbial, immune, endocrine and neural signalling → modification of gut–brain communication → possible contribution to neurological recovery.

This should be regarded as a hypothesis rather than an established mechanism. The currently available evidence does not permit the conclusion that Virechana improves neurological disease exclusively through the gut–brain axis.

DISCUSSION

Mridu Virechana and Snigdha Virechana occupy an important position in the classical management of selected Vataroga. The classical literature describes their use where Vata is associated with other Dosha, where Pakvashaya is involved or where abnormal movement of Vata occurs.

The modern concept of the microbiota–gut–brain axis provides an interesting biological perspective for examining this classical approach. The gut and nervous system communicate bidirectionally, and alterations in gut microbiota have been associated with several neurological disorders.

The relationship between gastrointestinal dysfunction and neurological disease is particularly relevant. Constipation is common in stroke and Parkinson's disease, while gastrointestinal disturbances are also reported in Alzheimer's disease. Therefore, restoration of appropriate bowel function may have importance beyond symptomatic relief.

Virechana directly influences the gastrointestinal tract and may alter intestinal microbial composition. The study by Chaturvedi et al. provides specific evidence regarding the effect of Virechana on gut flora. Similarly, bowel-cleansing research demonstrates that significant microbial changes may occur following therapeutic evacuation.

However, these findings should be interpreted cautiously. Alteration of microbial composition does not automatically mean correction of dysbiosis. The gut microbiota is a complex ecosystem, and the clinical significance of individual microbial changes depends upon microbial diversity, metabolic activity, host response and duration of the alteration.

The Ayurvedic concepts of Vata, Agni and Pakvashaya also cannot simply be equated with modern concepts such as the nervous system, digestive metabolism and intestinal microbiota. Such direct equivalence would oversimplify both systems.

A more appropriate approach is to consider the microbiota–gut–brain axis as a potential biological domain through which some effects of Virechana can be experimentally investigated.

The classical description of Snigdha Virechana in Vataroga, combined with contemporary evidence regarding gastrointestinal dysfunction and neurological disease, therefore provides a rational basis for future research. Controlled studies evaluating neurological outcomes together with bowel function, microbiota composition, inflammatory markers and metabolic mediators may help clarify the relationship.

FUTURE RESEARCH PERSPECTIVES

Future clinical research should investigate Virechana in carefully selected neurological disorders using standardized Ayurvedic assessment and objective neurological outcome measures.

Studies should document Prakriti, Dosha involvement, Agni, Koshta, disease stage, type of Virechana, dose and duration of treatment. Bowel function should be evaluated systematically before and after treatment.

Microbiological assessment should ideally include analysis of intestinal microbial composition before Virechana and at multiple intervals following the procedure. This would help determine whether observed microbial alterations are transient or sustained.

The influence of Samsarjana Krama should also be documented because dietary changes following Virechana may independently influence intestinal microbial composition.

Future studies may additionally examine intestinal permeability, inflammatory markers, microbial metabolites and neuroendocrine mediators to determine whether measurable biological changes accompany clinical improvement.

Such studies may help establish whether the classical concept of Virechana in Vataroga can be meaningfully correlated with contemporary understanding of gastrointestinal–neurological communication.

LIMITATIONS

The present review is based on classical Ayurvedic references and the scientific literature cited in the source article. Direct experimental evidence establishing that Virechana produces neurological recovery specifically through the microbiota–gut–brain axis remains limited.

The available clinical studies involving Virechana in Pakshaghata also generally involve Virechana as part of a broader Ayurvedic treatment protocol. Therefore, the independent contribution of Virechana cannot always be established.

Similarly, changes in gut microbiota following bowel cleansing or Virechana should not automatically be interpreted as therapeutic correction of dysbiosis.

The proposed mechanism should therefore be considered a probable hypothesis requiring further validation through appropriately designed clinical and experimental studies.

CONCLUSION

Virechana Karma is an important Shodhana procedure in Ayurveda and, although primarily associated with Pitta Dosha, is also described in selected Vataroga. Mridu and Snigdha Virechana have particular relevance where Vata is associated with other Dosha, where Pakvashaya is involved and where Vatanulomana is required.

Contemporary research has established the importance of the microbiota–gut–brain axis in the communication between the gastrointestinal tract and nervous system. Alterations in gut microbiota have been associated with stroke, Parkinson's disease, Alzheimer's disease, autism spectrum disorder and several other neurological conditions.

Virechana acts directly upon the gastrointestinal tract and has been reported to influence gut microbial composition. The gastrointestinal complications commonly observed in neurological disorders, particularly constipation, further strengthen the rationale for investigating gastrointestinal interventions in neurological health.

Therefore, the classical concepts of Pakvashaya, Vatanulomana, Agni and Snigdha Virechana may provide a valuable conceptual basis for investigating the relationship between Virechana and the microbiota–gut–brain axis.

However, the proposed mechanism remains a hypothesis. Further well-designed clinical and experimental studies are required to determine whether modulation of gut microbiota and gut–brain communication contributes meaningfully to the therapeutic effects of Virechana in neurological disorders.

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