Review Article

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A REVIEW ON CONVENTIONAL APPROACH TO THE MANAGEMENT OF KARNASRAVA WITH SPECIAL REFERENCE TO CHRONIC SUPPURATIVE OTITIS MEDIA: AN AYURVEDIC PERSPECTIVE

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ABSTRACT

Chronic suppurative otitis media is one of the commonest infective disorders in pediatric population and most common cause of preventable deafness. India has a high overall incidence of this infective disease. Affection of children at an early age may result in hearing impairment causing language and cognitive deficits. Modern system of medicine has various limitations in the management in the form of either high resistance to antibiotics or ototoxicity of drugs limiting their role. Surgical options are not easily available and also have serious complications. Ayurveda presents a similar conditions namely Karnasrava which resembles to chronic suppurative otitis media on the basis of etiology and clinical manifestations. Ayurveda describes handful of modalities to be used in it with good outcome. These modalities include use of oral and topical drugs, special cleansing procedures and systemic approach. These treatment modalities are discussed in this paper with evidence of their efficacy from recent clinical trials.

Keywords: Ayurveda, Karnasrava, Karna poorana, CSOM, antimicrobial

INTRODUCTION

Chronic suppurative otitis media (CSOM) as per WHO guidelines is defined as a chronic inflammation of the middle ear and mastoid cavity, which is characterized with recurrent ear discharges or otorrhoea through perforation of tympanic membrane. The prevalence of CSOM varies widely across world mostly affecting countries of South East Asia, Western pacific regions and Africa. According to WHO, the global burden of the disease is around 65 - 330 million individuals. India has highest prevalence among reported South East Asian countries and it is about 7.8 % reported from school survey studies from Tamil Nadu.[1] The initiation of the disease is vastly in the childhood period in the form of an acute infection resulting in acute otitis media (AOM). This usually result in tympanic membrane perforation which if remains open and kept discharging mucoid material for periods ranging from 6 weeks to 3 months, despite medical treatment is then designated as CSOM.[2] This middle ear infection usually starts within first six year of life with a peak around 2 years.[3] In the course of disease there is recurrent middle ear infection often provoked by upper respiratory infections or soiling of ear by bathing or swimming.[4]

The usual pathogens in AOM and CSOM are different. In CSOM the bacterial pathogens may be aerobic (e.g. *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Proteus mirabilis*, *Klebsiella* species) or anaerobic (e.g. *Bacteroides*, *Peptostreptococcus*, *Propionibacterium*) and fungal include *Candida albicans*.[5-7] In all these pathogens *P. aeruginosa* is most prevalent and more destructive, causing deep seated and progressive destructive disease of middle ear and mastoid structures. In long run, CSOM due to its more severity and longer course results in hearing impairments or deafness. This hearing impairment in children is likely to inhibit language and cognitive development. Ultimately children suffer with learning disabilities and poor scholastic performance and are not able to achieve according to their potentials.[8]

The best and cheap treatment of CSOM includes instillation of topical antiseptics or topical antibiotics after thorough aural toilet for at least 2 weeks for the short-term resolution of otorrhoea. But all the topical drugs are not safe and they may be ototoxic by themselves. Long term treatment protocol needs surgical interventions. However, surgery carries the risks of deteriorating hearing, as well as the potential damage to the facial nerve limiting its use.[9]

This scenario of CSOM disease profile presents a legitimate search for management strategies outlying to conventional therapies. Ayurveda, the holistic science of life illustrated a similar condition named Karnasrava (discharging ear) having chief symptom as a discharging ear, analogous to the condition CSOM. Karnasrava is described as an independent disease in all the classical Ayurveda texts. The causes and clinical profile of karnasrava match up to that of CSOM. The various management strategies used to treat karnasrava are similar to CSOM like use of multiple local procedures to keep ear dry and infection free. In this article Ayurvedic concepts and treatment protocols of Karnasrava are researched from classical texts. Also various drugs described in Ayurveda are searched for their antibacterial potential against common causative agents of CSOM.

Ayurvedic perspective

Ayurveda classics described three condition which causes chronic discharges from ear namely Karnasrava (discharging ear), Putikarna (foul smelling ear) and krimikarna (maggots in ear).[10] There treatment principles are also on the same line. Acharya Sushruta has provided some insight on local procedures which acts on the principle of aural toileting and topical antibiotic instillation. Acharya Charak advocates management of Karnasrava on the line of vranachikitsa (wound management).[11] Various procedures described in Ayurveda for keeping ear clean and infection free in cases of Karnasrava includes Karna Pooran (drug instillation in ear), Karna Dhoopan (fumigation of ear), Pramarjana (ear cleaning), Shirovirechana and dhawana/ Prakshalna (ear toileting).[10] Some oral drugs are also mentioned for the management of Karnasrava.

Oral Drugs

Oral drugs with generalized action on all ear diseases or specially ear diseases of infective etiology are described in various Ayurveda classics. Some of them are compiled in Table 1.

Procedures for the management of Karnasrava

Karna Poorana

It is procedure of instillation of drug in either of form like powder, decoction, juices, oil or combination, into affected ear after preparation of the part by preceding procedures like sudation. The medicine is kept in the ear for given time durations. Acharya Sharngadhara has mentioned this time duration as 100, 500 or 1000 matra time (time taken for blinking of eye lids).[14] Various drug formulations used for Karna Poorana are described in Table 2.

Karna Dhoopan

It is a technique of fumigation of ear with the smoke of anti-infective drugs. One of the best drug described by Acharya Sushruta for this purpose is a well known anti-infective and anti inflammatory drug namely Guggulu.[15]

Shirovirechana

Nasya is a unique concept of Ayurveda to administer drugs through nasal route for most of the diseases affecting head and neck area. Ayurveda consider nasal cavity as route to various organs of head region and drug administered through nose reaches these organ and cleanse them from pathogenic factors.[18] Shirovirechana is one of the many types of nasya. The preceding procedures of nasya include massage of nose, forehead, cheeks and neck with desired oil followed with local sudation. In main procedure patient is laid down in supine position and then desired drug is administered into nostrils in stipulated quantity followed by deep inspiration so that drug can spread to whole cavity. Acharya Sharngadhara has described two types of shirovirechana nasya- Pradhaman and Avapeedana. These both type of nasal drug administration is useful in various diseases of eye, ear, head and nose. Shunthi (*Zingiber officinale* Roscoe) with Jaggery and Pippali (*Piper longum* Linn.) with saindhav lavana (Rock salt) are most valuable avapeedana nasya for this purpose.[19]

Pramarjana

The word pramarjana means cleaning of some body parts through swabs etc. Karna pramarjana is procedure of cleaning ear with the help of cotton or gauze piece soaked in oil or other antiseptic decoction of drugs. Various oils used for Karnapoorana can also be used for cleaning ear in the form of pramarjana.

Prakshalana

Prakshalana word is used for washing some body parts to clean them like *Hasta prakashalana* for hand washing. Karna Prakshalana is a technique of ear toileting with various liquid drugs like decoction, fresh juices and oil. Decoction of Sursadi Gana and Rajvrikashadi Gana drugs are known to be best for cleansing ear.[10]

Decoction of panchkashaya drugs i.e. Haritaki (*Terminalia chebula* Retz.), Amalaki (*Phyllanthus emblica* L.), Manjishtha (*Rubia cordifolia* L.), Lodhra (*Symplocos racemosa* Roxb.) and Tinduka (*Diospyros tomentosa* Roxb.) are also useful for Karna Prakshalana in conditions like karnasrava.[12]

Clinical Studies

Karnapoorana

As mentioned above Karnapoorana is procedure of local drug administration where ear cavity is filled with lukewarm drugs usually in liquid form (oil, cow's urine and juices) for a stipulated period. The procedure is done after local snehana (oil massage) and swedana (sudation) around the ear which increases local circulation, hence better absorption of the drug.

Gandhaka Tail

A clinical study on the patients of CSOM used Gandhaka tail as study drug in 23 cases. Gandhaka tail, a herbo-mineral preparation, is a type of medicated oil prepared from katu tail (mustard oil) by oil preparation method. In the preparation of this drug (oil) Haridra (*Curcuma longa* Linn.), sudha Manhashila (purified Arsenic dissulphide) and sudha Gandhaka (purified sulfur) are taken as kalka dravyas (paste form of drug) while Dhatura swarasa (juice from *Datura metal* L.leaves) is taken as drava dravya (liquid drug). Two drops of prepared oil is instilled into affected ear after proper cleaning for 7 days in night time only. Assessment was done on the various signs and symptoms of CSOM. Results show statistically significant improvement in all subjective and objective parameters like ear discharge, earache, perforation of tympanic membrane, tinnitus and deafness etc.[20]

Ark Tail

Palmer *et al* treated 28 patients of Karnasrava in a clinical study. Patients were grouped into two groups with 14 patients in each group. One group was treated with Arka Taila, a type of medicated oil prepared from katu tail (mustard oil) by oil preparation method by using paste of Haridra (*Curcuma longa* Linn.) and Arkapatra (*Calotropis gigantea* Linn.), the other group was treated with Clotrimazole ear drops (standard control). Ark tail was administered as karna poorana in the dose of 10-15 drops for 100 matra (time taken for eye blinking) for 15 days at an interval of 5 days while clotrimazole was given as 2 drops thrice daily for 15 days. Assessment was made on the basis of clinical parameters. Results of the study indicate that Arka Taila is as effective as Clotrimazole in all the signs and symptoms of Karnasrava.[21]

Panchkashaya Kalp

In another clinical study on the patients of Karnasrava, 23 patients were treated with an herbal medicine Panchkashayakalp. This medicine is composed of paste of drugs namely Haritaki

(*Terminalia chebula* Retz.), Amalaki (*Phyllanthus emblica* L.), Tinduka (*Diospyros tomentosa* Roxb.), Lodhra (*Symplocos racemosa* Roxb.), Manjishtha (*Rubia cordifolia* L.) mixed in Madhu (honey) and Kapittha Swarasa (juice of *Limonia acidissima* L). The drug was instilled as karna poorana in a dosage of 2 drops of lukewarm drug thrice daily after cleaning ear for 10 days. Follow up were made on 20th day and 30th day. Patients were assessed on basis of clinical parameters. Results of the study shows statistically highly significant improvement in ear discharge.[22]

Karna Prakshalana

Panchkshiri Kwath

In a clinical study on patients of Karnasrava, Shukla *et al* registered 60 patients and divided them randomly into two groups as experimental group and control group. In experimental group patients were treated with Arogyavardhini Vati (a herbo-mineral ayurvedic formulation) 500 mg thrice a day with Sharkarayukta Jala (water sweetened with sugar) and Pramarjana (ear toileting) with Panchkshiri Kwatha (decoction of Vata – *Ficus benghalensis* Linn., Asvatha – *Ficus religiosa* Linn., Udumber – *Ficus racemosa* Linn., Plaksha – *Ficus lacor* Linn., Parisha – *Thesposia populnea* Linn). Control group patients were treated with cap Amoxicillin 500 mg thrice a day and aural toilet with dry cotton swab. Assessment was done on various subjective and objective clinical parameters. Both the groups show almost equal and good response in all clinical parameters.[23]

Karna Pichu

Madhukadi Tail

In a clinical study on CSOM Gupta *et al* registered 40 patients and randomly divided them into two groups. One group was treated with Madhukadi tail karnapichu while other group received in addition to madhukadi tail karna pichu, oral Rasanadi guggulu 2 tabs twice daily for one month. The total treatment duration was one month. The assessment was done on clinical parameters like Karnasrava, amount of Karnasrava, Karna- shula, Karnakandu, Karna badhirya, Karnanad. Results show statistically significant overall improvement in both groups with slightly higher improvement in Rasnadi guggulu group.[24]

Mixed Treatment Protocols

Karnapurna and Nasya

Prakashbhai *et al* in a clinical study on CSOM treated 28 patients in two groups of 14 patients each. One group was given Nasya (nasal administration of drugs with special technique) with shadbindu tail in dose of 6 drops in each nostril for 5 days prior to treatment. Other treatment were same in both groups and includes karna poorna with Gandhakadi tail 1 ml in ear once daily in evening and 1 gm Saptanga guggulu thrice daily, both for 45 days. Patients were followed up for one month at 15 days interval. Assessment was based on various clinical parameters. Both the group showed almost equal results in different symptoms. But objectively both group showed insignificant results.[25]

Karna Pichu and Dhoopan

Shashikala *et al* in a clinical study registered 40 patients with karnasrava and randomly divided them into 2 groups with 20 patients each. Group A was treated with Vachalashunadi taila Karnapichu and Group B was treated with Nimbapatradi Karnadhoopana. Vachalashunadi taila contains Vacha (*Acorus calamus* Linn), Lashuna (*Allium sativum* L.), Haridra (*Curcuma longa* Linn.), and Bilwapatra swarasa (juice of leaves of *Aegle marmelos* L.), while Nimbapatradi karnadhoopana is fumigation of ear with the smoke of drugs namely Nimbapatra (leaves of *Azadirachta indica* A. Juss.), Vacha (*Acorus calamus* Linn.), Hingu (*Ferula northax* Bioss), Sarpi (*Butyrum deparatu*), Lavana (Sodium Chloride) and Sarshapa (*Brassica campestris* Linn.). The assessment was done on subjective parameter of hearing loss and objective parameters like ear discharge, perforation of tympanic membrane and pure tone audiometry. The results of the study show an improvement of 38.6 % in Group A (tail group) and 30.5 % in Group B (dhoopan), with the percentage difference of 8.1 %. Group A showed better results when compared to Group B.[26]

Table 1: Oral Ayurvedic drugs described in the management of Karnasrava

Name	Contents
Rasnadi Guggulu	Rasna, Amrita, Eranda, Devdaru, Saunth, Guggulu
Sarivadi vati	Sariva, Madhuka, Kushtha, Chaturjata, Priyangu, Nilotpala, Guduchi, Lavanga, Triphala, Lauha Bhasma, Abhraka Bhasma, and Swaras of Bhringraj, Kakmachi, Gunja, Decoction of Arjun[12-13]

Table 2: Various drug formulations described for Karnapoorana

Name of drug/ formulation	Form of formulation	Main contents
Madhukadi tail	Oil	Madhuka, Dashmoola, Daruharidra, Kadali, Kushtha, Shigru, Vacha, Devadaru, Saunf, Rasanjana, Saindhava, Vida Lavana, Sarjikshara, Tila tail
Gandhaka tail	Oil	Haridra, Gandhaka, Sarshpa Tail, Dhatura Swarsa
Amaradi swarasa	Juice	Amara, Kapitha, Madhook, Sal, Dhav
Pringavadi tail	Oil	Priyangu, Madhuka, Patha, Dhataki, Manhashila, Shalparni, Manjishtha, Lodhra, Laksha, Kapitha, Tila tail
Kushthadya tail	Oil	Kushtha, Hingu, Vacha, Devadaru, Saunf, Sunthi, Saindhava, Tila tail and Goat's urine
Hartal + Gomutra	Liquid	Hartal mixed with Cow's Urine
Rasnajana + Stanya	liquid	Rasnajana with Human Milk
Lakshadi churna	Churna	Laksha, Rasanjana, Sarja
Panchkashaya	Decoction	Tinduka, Abhya, Lodhra, Samnga, Amalaki
Putpakva Gondaka swarsa sidha tail	Oil	Chhatarak, Saindhava Lavana, Tila tail[12,15-17]

Table 3: Ayurvedic herbs with their antimicrobial properties

Name of Drug	Parts used	Antimicrobial activity	Study design	Researchers
Tulsi	Essential oil	*Staphylococcus aureus* (including MRSA), *Escherichia coli*, *Pseudomonas aeruginosa*	*In vitro*	Yamani HA *et al*[27]
Haridra	oil	*Staphylococcus aureus*, *E. coli*, *Pseudomonas aeruginosa*	pour plate method	Negi PS *et al*[28]
Lahsuna	Essential oil	*S. aureus*, *E. coli*, *P. aeruginosa*	disc diffusion method	Casella S et al[29]
Guduchi	ethanolic stem extracts	*Proteus vulgaris, Escherichia coli, Staphylococcus aureus*	disc diffusion method	Jeyachandran R *et al*[30]
Babul	Methanol extract	*E.coli, S.aureus, K.pneumoniae*	Agar gel diffusion	Tambekar *et al*[31]
Mustaka	Acetone extract	*Proteus vulgaris*	Agar gel diffusion	Tambekar *et al*[31]
Ashwagandha	Flavanoids extract	*C. albicans, S. aureus, P. mirabilis, E. coli*, *P. aeruginosa*	disc diffusion assay	Singh G *et al*[32]
Tumburu	Essential oil	*Staphylococcus aureus, Escherichia coli*	Broth Dilution Technique	Guleria S *et al*[33]
Nishotha and Sarala	resin rich methanolic extracts	*S. aureus*, *E. coli*, *P. aeruginosa*	Agar gel diffusion	Shuaib M *et al*[34]
Bilwa	Dried fruit extract	*P. aeruginosa, E. coli, S. epidermidis, S. aureus*	disc diffusion method	Supria D *et al*[35]
Gokshura	Ethanol extract of fruit	*S. aureus*, *E. coli*, *P. vulgaris, C. albicans*	broth microdilution method	Al-Bayati FA *et al*[36]
Shatpushpa	Crude extract	*S. aureus*, *E. coli*, *P. aeruginosa, P. vulgaris*	disc diffusion method	Al Akeel R *et al*[37]
Aragvadha	Fruit pulp extract	*S. aureus*, *E. coli*, *P. aeruginosa, C. albicans*	disc diffusion method	Bhalodia NR *et al*[38]

Antimicrobial Herbs for CSOM

There are profound research activities going on in recent times to evaluate potential antimicrobial herbs. However most of them are *in vitro* studies and they show high potential of herbs acting as antibacterial and antifungal agents. The ayurvedic herbs possessing antimicrobial properties against main causative microbes of CSOM are compiled here in Table 3.

DISCUSSION

CSOM is well described as Karnasrava in various Ayurveda classics. Its management is described as part of three common diseases with chief symptom as discharging ear. The main protocol of treatment is same as that of wound management, which includes various measures to keep area dry, clean, clear of microbes and providing ideal conditions for healing. Various procedures described in Ayurveda for the management of discharging ear, fulfill these requirements of wound management. Furthermore Shirovirechana is postulated as first procedure for managing karnasrava, which give the insight of treating CSOM from its primary origin site. As in most of instances discharging ear is preceded by upper respiratory infection, shirovirechana prevents respiratory infection and also help in decongesting eustachian tube and increasing middle ear aeration as well as immunity. Other procedures described in ayurvedic classics are mainly achieving local toileting, control of infection by their anti-infective potential and relieving local congestion. Moreover drugs used in various local procedures pacify Dosha vitiated at local site. They also possess antimicrobial activities as shown *in vitro* studies, thus helping in controlling infection. The antimicrobial activities are targeted at common pathogens of CSOM, helping in early resolution of infection.

CONCLUSION

With all above facts it can be concluded that Ayurveda possesses quality approach towards alternative management of CSOM with use of oral drugs, topical drugs as well as cleaning procedures. The efficacy of these procedures and drugs are being revalidated through various *in vitro* and clinical studies. However the studies included in this review have limitations in various aspects like sample size, randomization etc. These limitations must be addressed in forthcoming studies to increase reliability and validity of ayurvedic management of CSOM.

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