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Exploring therapeutic potential of fasting (Upvasa)– A comprehensive review

Review Article

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Abstract

Background: Fasting, an ancient practice observed in many cultures, holds potential therapeutic value beyond its traditional spiritual significance. It may be defined as complete voluntary self-restraint from taking any kind of food for specific time, in order to give rest to digestive system". In Ayurvedic classics it may correlated with *Upvasa* which is one among the ten types of *Langhana* (lightness promoting therapy) and also included in *Daivavyapashraya chikitsa* (Therapeutic Rituals). Research suggests that Fasting (*Upvasa*) can positively affect various aspects of health, including weight management, metabolic health, cellular repair mechanisms, cognitive function, mood regulation, inflammation reduction, and immune system modulation. Objective: This review examines current research to elucidate the therapeutic potential of Fasting (*Upvasa*) for promoting health and facilitating healing processes. Material and Method: This review paper has been taken from different Ayurvedic manuscripts, Modern literatures and Various searching engines like PubMed, Web of Science Scopus, Google Scholar, SCI, Research gate and government portal like Ayush Portal, Namaste Portal etc. Discussion: Research suggests that fasting regimens, such as intermittent fasting or prolonged fasting, can lead to reductions in body weight, body fat percentage, and improvements in metabolic markers such as insulin sensitivity and cholesterol levels. It also enhances cognitive performance, memory, and focus, possibly through the upregulation of brain-derived neurotrophic factor (BDNF) and other neuroprotective pathways. By reducing inflammatory markers and promoting immune cell regeneration. Fasting stimulates autophagy, which promotes cell renewal and slows down the aging process. Conclusion: This paper discusses the physiology, historical views, and benefits of fasting on many health parameters. Integrating fasting into healthcare practices requires comprehensive understanding and guidance to ensure safe and effective implementation.

Keywords: Autophagy, Intermittent fasting, Insulin sensitivity, *Langhana, Obesity, Upvasa*.

Introduction

Fasting, or "Upavasa," is an ancient practice that has been deeply embedded within various cultural and religious traditions across the globe. In the context of Ayurveda, fasting holds a special place as a method to promote physical and mental well-being, believed to balance the three doshas and cleanse the body of toxins (Ama). While fasting has long been practiced for spiritual purification and self-discipline, modern science is now beginning to unveil its wide-ranging therapeutic benefits, particularly in the prevention and treatment of chronic diseases. In recent years, there has been a surge of interest in intermittent fasting, caloric restriction, and prolonged fasting regimens for their potential health benefits. Studies have shown that these fasting protocols may improve metabolic health, enhance cellular repair mechanisms like autophagy, reduce inflammation, and even extend lifespan. Beyond weight loss and metabolic improvements, fasting has been investigated for its role in improving cognitive function, promoting longevity, and reducing the risk of diseases such as diabetes, cardiovascular disorders, and certain types of cancer. In 2016, Yoshinori Ohsumi was awarded the Nobel Prize in medicine for his studies on autophagy, a mechanism that allows cells to recycle and regenerate their material. Through the evolutionarily conserved lysosomal catabolic process of autophagy, cells break down and recycle intracellular external (bacteria and viruses) and endogenous (damaged organelles, misfolded or mutant proteins and macromolecules) components. Although Yoshinori Ohsumi's work has little to do with this review, it does contribute to our understanding of how cells survive and maintain their health during fasting, as they break down into proteins and unnecessary components that they can repurpose for energy. His research focuses on a process that is essential to the survival and well-being of cells. Higher creatures, including humans, use the autophagy genes and metabolic pathways he found in yeast. Aim of the research paper is to evaluate the therapeutic potential of fasting, drawing on a variety of scientific studies, traditional Ayurvedic texts, and clinical trials, to offer a holistic understanding of its effects on human health.

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Materials and Methods

Comprehensive information about the topic has been examined and gathered by a systematic screening of many Ayurvedic classical books, such as the Charaka Samhita, Sushruta Samhita, Astanga Hridaya, Chakradutta, Yogaratnakar, Ayurvedic vocabularies, etc. With the use of the Boolean operators "AND," "OR," and "NOT," various literature databases, including PubMed, Google Scholar, Web of Science, Scopus, MEDLINE, DHARA, AYUSH Portal, and Namaste Portal, were searching for terms like "Upvasa," "Fasting," "Intermittent Fasting," "Intermittent fasting -Autophagy," " Intermittent fasting -Insulin Sensitivity," "Upvasa-Langhan," "Upvasa- Agni," "Intermittent - Fasting," and "Fasting- Gut microbiota," Filters including free full papers, within ten years, review articles, clinical trials, and others were employed in this paper.

Results

Etymology and Definition

According to contemporary science, fasting is" Complete voluntary abstinence from taking any kind of food for a specific period of time, in order to give the digestive system a rest." The term “Upvasa” in Sanskrit refers to fasting and Upa means "near" and Vasa means "to stay". The phrase "to sit or stay near (the Lord)" implies that fasting is a way to keep the Lord at the forefront of your heart and mind. Vachaspatyama defines Upvasa as abstaining from food during the day and night. There are two sorts of Upvasa: “avaidh,” or unlawful fasting, and “vaidha,” or lawful fasting (Vachaspatyama, 1322). Classical Ayurvedic texts define fasting as Upvasa. It is described as refraining from eating, drinking, licking, or chewing any of the four types of food(1). Upvasa refers to a particular kind of Daivavyapasraya chikista, which is the practice of fasting to treat illness. (Namaste Portal)(2).

Ayurvedic perspectives of Upvasa

The two therapeutic modalities /techniques described by Ayurvedic texts, brihmana or nourishing therapy and langhana or depletion therapy, aim to alleviate pain and diseases. Langhana therapy is characterized as a method that results in a decrease or depletion of the bodily virtues, leading to a lighter body. Fasting, exercise and sun exposure and elimination therapies are some examples of depletion therapies that are described(3). Therefore, it is imperative to thoroughly understand and apply the crucial function that fasting plays as one of the therapeutic modalities during the treatment of various diseases and during different stages of the diseases, as detailed in the renowned Ayurvedic classics.

Principal of fasting

The ash particles that stay on it lessen the intensity of the fire, which hinders the burning process. Similar circumstances apply to the vitiated dosha of the human body, particularly to the digestive viscera, or Aamashaya in Ayurveda. In addition to producing ama (metabolic toxins), which are said to be the fundamental cause of all ailments, this weakens and disables the digestive fire and debilitates the stomach. which ultimately cause blockages in the body's pathways, resulting in various illnesses. When combined with low nourishment in the viscera, fasting not only clears the channels and ignites the digestive fire, but it also significantly destroys a number of metabolic toxins. Fighting sickness is aided by this procedure. All the same, it is not advised at all to feast before or after keeping a fast(4). Ayurveda suggests that following a fast, one should eat something that is simple to digest, such as freshly made rice gruel. This food should be hot, light enough to be assimilated, and liquid in consistency. The cold and moist season from the end of February onwards is unusually ideal for fasting, according to Ayurveda, which maintains that spring (Shishira Rutu) is the finest time for fasting. The body's self-cleaning mechanisms are activated when the force of the sun begins to boost. Ayurveda does not advocate giving up all food; rather, it advises taking light meals during fasting, the number of which can be adjusted based on body type and dosha. According to Ayurveda, the type and timing of fasting for detoxification varies depending on the body type of the individual. Fasting according to one's bodily type resembles to fasting according to doshas. This is due to the fact that every Ayurvedic treatment should be tailored to the unique constitution of each individual. Different toxicities arise from the vitiation of the mental doshas Tamas and Rajas in addition to the physical doshas Vata, Pitta, and Kapha(5). The body should eliminate waste products, body fats, and metabolic deposits while fasting. As a result, losing body weight is a continual component of this process.

Table 1: Therapeutic effect of Fasting (Upvasa) in Ayurvedic Classics

S.No.	Vyadhi (disease)	Stage/Duration
1	Jwara (Fever)	According to Acharya Vagbhata fasting indicated in Purva Roopa Avastha (prodromal stage).(6) On the basis of patient's Bala (strength) and also the bala of the disease, fasting should be recommended.(7)
2	Raktajaroga (blood borne diseases)	Ama dosha generally aggravates pitta (the biological element responsible for digestion & metabolism, color complexion, vision, etc. and rakta). Thus, the patient has to be kept on a fast at first in raktajaroga(8).
3	Santarpanajanyavikara (diseases due to over nutrition)	Over nutrition-related diseases include Diabetes Mellitus, small abscess including diabetic boils, itching, urticarial patches, leprosy, anemia, fever, dysuria, anorexia, drowsiness, frigidity, excessive obesity, heaviness of body, obstruction of sense organs and channels, confusion/ delusion of intellect, always closing eyes, edema/ inflammation and with additional conditions. To

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4	Chardi-roga (vomiting)	In Ayurveda, chardi is caused by the disease connected to Amashaya (stomach), which is the sthana or seat of Kapha dosha. Therefore, the treatment for the disease is considered to be langhana (depletion therapy) in terms of Upvasa.(10)
5	Atisara (diarrhoeal diseases)	In the early stages of Atisara (diarrhea), body is associated with ama (metabolic toxins), fasting is recommended. Fasting eases the removal of toxins and makes the body for added therapy. If there is a lot of watery diarrhea, emesis (vamana) should be performed under medical supervision, and fasting must come after.
6	Visoochika (gastroenteritis)	Fasting is recommended.(12)
7	Shotha-Roga (Oedema)	The patient has to undergo langhana based on their strength if ama is the reason for the shotha (oedema).(13)
8	Vataja abhishyanda	Patient should fast for 3 days or only at night food can be given.(14)
9	Pratishyaya (rhinorrhoea)	When taking carminative drugs for Jeerna pratishyaya (chronic rhinorrhea), which is marked by fever, vomiting, body aches, heaviness, tastelessness,

Naturopathy perspectives of Fasting

One of the pancha-mahabhootas, Akasha, is represented by fasting. The easiest way to rid the body of sickness and cleanse it is by fasting. Fast therapy expert Dr. Carington states that a fast begins with skipping the first meal and concludes when a true hunger sensation arises. Fasting is a great way to improve your physical, mental, and spiritual well-being, but its benefits may only be seen if you follow a methodical approach(15). Fasting is recognized as a therapy in naturopathy for the majority of diseases. The body significantly regains the Aakash tatva (space element) while fasting(16). Dr. Herbert M. Shelton successfully treated hundreds of patients with a variety of chronic illnesses throughout his extended study on fasting(17),(18). Fasting, according to naturopathy, is a way to give the digestive system a break. The important energy required for food digestion is entirely focused on curing the body of illnesses throughout this procedure(19). In his book Key to Health, Mahatma Gandhi outlined his beliefs regarding fasting, writing, "We must not fill the digestive tract with unnecessary food stuffs." Eat little more than what our bodies require. It happens frequently that people overeat or consume indigestible foods without realizing it. One can maintain equilibrium by fasting once a week or once every two weeks, for example. One should skip one or more meals during the day if they are unable to fast for the entire duration(20).

Modern perspectives of fasting

Concept of Intermittent Fasting

Many protocols and strategies for intermittent fasting have been proposed and are currently being used. Some of the common fasting approaches are shown in **Table: 2** (21), (22).

Table 2: Some of the common fasting approaches

S. No.	Practice	Frequency	Duration	Other Considerations
1	Alternate day	Every alternate day	24 hours	-
2	5:2	Two days weekly	24 hours each day	2 other days involve a very low-calorie diet
3	Time-restricted feeding	Daily	14 hours	Food is eaten over 6 hours period
4	B2 regimen	Daily		Breakfast 6a.m-10a.m, lunch 12-2p.m, no dinner
5	Weekly 1 day Fasting	Once a week	24 h	One-day-a-week diet consisting mainly of water and six days of usual meals
6	Intermittent very low-calorie diet (VLCD) therapy	Variable	24 h	1-d VLCD refers to VLCD for one day per week, and 5-d VLCD is VLCD for five days in a consecutive, repeated every five weeks.

Discussion

Intermittent fasting in Obesity

It has been demonstrated that intermittent fasting reduces adiposity, especially from visceral and truncal fat due to comparatively small calorie deficits. Patients may have changes in their leptin/adiponectin levels and sensitivity as a result of this decrease in adiposity, which would lead to better appetite control(23).

Intermittent Fasting in Cardiovascular Disorders

Lower adiponectin, higher C-reactive protein, smaller LDL particles, and other metabolic variables that are linked to the development of atherosclerosis and coronary artery disease are all indicators of increased inflammation that are brought on by insulin resistance(24). Moreover, insulin raises the risk of fluid retention and congestive heart failure in addition to being linked to atherogenic dyslipidaemia(25). Therefore, it would be expected that cutting insulin levels with intermittent fasting will lower serious adverse cardiovascular events.

Intermittent Fasting in Hypertension

The parasympathetic nervous system's activation, resulting from an increase in the activity of the brainstem's cholinergic neurons, may be the mechanism underlying the lowered blood pressure during intermittent fasting(26). Although glutamatergic receptor activation is the primary stimulus that causes brain-derived neurotrophic factor (BDNF) to be created, studies have shown that intermittent fasting is an important environmental trigger as well(27).

Intermittent Fasting in Prediabetes, Diabetes and Insulin Resistance

Regarding the emergence of insulin resistance, various mechanisms have been hypothesized. Increasing adiposity and chronic inflammation that follows, which causes tissues to become insulin resistant, are linked, according to a well-known notion. By reducing calorie intake and altering the metabolism, intermittent fasting can lower obesity and the associated insulin resistance. Another theory is that lower energy intake, like that obtained by intermittent fasting, will result in higher levels of AMPK and a sustained drop in insulin secretion, which probably contributes to the improvements in glucose homeostasis and insulin sensitivity(28).

Intermittent Fasting in Neurodegeneration

Fasting therapy has not been investigated as a potential treatment for individuals with Alzheimer's disease (AD), Parkinson's disease (PD), or Huntington's disease (HD)(29). However, research on ketogenic diets in a variety of diseases has only shown indirect evidence. Ketogenic diets, also known as high-fat, adequate-protein, low-carb diets, drive the body to use fat for energy rather than carbohydrates, creating ketones and triggering a number of fasting-related metabolic processes to mimic a fasted metabolic state. A small case series of PD patients exhibited better motor symptoms after four weeks on a ketogenic diet(30). After eight weeks on a ketogenic diet, several of the most crippling non-motor symptoms that are least sensitive to levodopa improved in a later randomized controlled research with forty-seven patients with mild-to-severe Parkinson's disease (PD)(31). Regarding the effect of a ketogenic diet on AD, one case series consisting of fifteen people with mild-to-moderate AD showed some improvement in cognitive function after a 12-week program(32). The fact that AD does not significantly influence ketone utilization despite a major decrease in brain glucose absorption may help to explain these results(33).

Intermittent Fasting in Cancer

The feasibility and beneficial weight loss effects of various forms of Intermittent Fasting (IF) in overweight and obese men and women have led to clinical trials testing its effects on metabolic and hormonal end points associated with cancer development or prognosis, mostly in patients without cancer. Although studies of IF in nonhuman primates have not been reported, those trials have been carried out(34),(35). A 5:2 diet or alternate day fasting has been shown to improve some cancer risk factors in a number of short-term (2–6 months) randomized clinical trials. These include increased adiponectin and decreased levels of leptin, insulin, and glucose during fasting, (36) all of which have been linked to the pathogenesis of cancer(37). Autophagy, a process that enables cells to remove damaged components and recycle them for energy, is another mechanism activated during fasting. IF has been shown to enhance autophagic activity, which can promote the elimination of precancerous and cancerous cells(38).

Conclusion

In conclusion fasting represents a profound intersection between ancient wisdom and modern science, offering a holistic approach to health and well-being. From its roots in Ayurvedic tradition, where it is revered as a means of balancing the body's internal energies and detoxifying the system, to its growing recognition in contemporary scientific research, fasting emerges as a powerful therapeutic tool. Fasting has shown potential in regulating metabolism, promoting cellular repair through autophagy, reducing inflammation, and enhancing cognitive function, among other benefits. It helps in managing chronic conditions such as obesity, type 2 diabetes, cardiovascular diseases, and neurodegenerative disorders.

References

1. Chakrapanidasa. Abhinava Chintamani. Trans: Kishore P, Das S, Nanda M. 1th ed. New Delhi: Kendriya Ayurveda and Siddha Anusandhana Kendra; 1999. P. 67
2. https://namstp.ayush.gov.in/#/sat
3. Sharma RK, Dash B. Charaka Samhita of Agnivesha. 8th ed. Varanasi: Vimana Sthana; 2004. P. 289-90
4. Radhakanthadeva. Shabda Kalpa Druma. New Delhi: Rashtriya Sanskrit Pratishtana., 2002. Vol. 1.p. 260.
5. Deasi VR. Ayurveda Kriya Shareera. Allahabad: Sri Baidyanath Ayurveda Bhavan Limited; 1999. P. 18-21.
6. Jyotir AM. Astanga sangraha of vrddha vagbhata with the sasilekha sanskrit commentary by Indu. 1st ed. Varanasi: Chi-kitsa Sthana Chowkhamba Sanskrit Series Office; 2006. P. 421.
7. Jyotir AM. Astanga sangraha of vrddha vagbhata with the sasilekha sanskrit commentary by Indu. 1st ed. Varanasi: Chikitsa Sthana Chowkhamba Sanskrit Series Office; 2006. P. 423.
8. Agnivesha, CharakSamhita with Ayurveda Dipika Commentary of Chakrapani Datta, Ed. Acharya Yadavji TrikarmaJi, Chaukhambha Surbharti Prakashan, Varanasi. Edition7th, 2002, Chikistasthana 4/29.
9. Agnivesha, CharakSamhita with Ayurveda Dipika Commentary of Chakrapani Datta, Ed. Acharya Yadavji TrikarmaJi, Chaukhambha Surbharti Prakashan, Varanasi. Edition7th, 2002, Sutrasthana 23/5-8
10. Trikamji J, Narayan R. Sushruta Samhita of Sushruta with the Nibandhasangraha commentary of Sri Dalhanacharya and the Nyayachandrika panjika of Sri Gayadasacharya on Nidanastana. 8th ed. Varanasi: Chaukhamba Orientalia; 2005. P 756.
11. Trikamji J, Narayan R. Sushruta Samhita of Sushruta with the Nibandhasangraha commentary of Sri Dalhanacharya and the Nyayachandrika

panjika of Sri Gayadasacharya on Nidanastana. 8th ed. Varanasi: Chaukhamba Orientalia; 2005. P 699.
12. Trikamji J, Narayan R. Sushruta Samhita of Sushruta with the Nibandhasangraha commentary of Sri Dalhanacharya and the Nyayachandrika panjika of Sri Gayadasacharya on Nidanastana. 8th ed. Varanasi: Chaukhamba Orientalia; 2005. P. 783.
13. Agnivesha, CharakSamhita with Ayurveda Dipika Commentary of Chakrapani Datta, Ed. Acharya Yadavji TrikarmaJi, Chaukhambha Surbharti Prakashan, Varanasi. Edition7th, 2002, Chikistasthana 12/17
14. Trikamji J, Narayan R. Sushruta Samhita of Sushruta with the Nibandhasangraha commen-tary of Sri Dalhanacharya and the Nyayachandrika panjika of Sri Gayadasacharya on Nidanastana. 8th ed. Varanasi: Chaukhamba Orientalia; 2005. P. 611.
15. Rastogi R (2001) An introduction to naturopathy. Asha Prakashan, Agra, 45, 46
16. Dewan AP (1999) Healthy living. AC Specialist Publishers, New Delhi, p 84
17. Shelton HM (1978) Fasting for renewal of life. Natural Hygiene Press, Chicago, 115
18. Shelton HM (1978) Fasting can save your life. Natural Hygiene Press, Chicago
19. (1999) Yogic and Nature cure treatments for Common ailments. CCRYN Publication, New Delhi, 12
20. Gandhi MK (1999) Key to health. Navjivan Publishing House, Ahmedabad, 43
21. Nowosad, K.; Sujka, M. Effect of Various Types of Intermittent Fasting (IF) on Weight Loss and Improvement of Diabetic Parameters in Human. Curr. Nutr. Rep. 2021, 10, 146–154. (CrossRef)
22. Anton, S.D.; Moehl, K.; Donahoo, W.T.; Marosi, K.; Lee, S.A.; Mainous, A.G.; Leeuwenburgh, C.; Mattson, M.P. Flipping the Metabolic Switch: Understanding and Applying the Health Benefits of Fasting. Obesity 2018, 26, 254–268. (CrossRef)
23. De Cabo, R.; Mattson, M.P. Effects of Intermittent Fasting on Health, Aging, and Disease. N. Engl. J. Med. 2019, 381, 2541–2551. (CrossRef) (PubMed)
24. Shulman, G.I. Ectopic fat in insulin resistance, dyslipidemia, and cardiometabolic disease. N. Engl. J. Med. 2014, 371, 2237–2238. (CrossRef) (PubMed)
25. Ingelsson, E.; Sundström, J.; Arnlöv, J.; Zethelius, B.; Lind, L. Insulin resistance and risk of congestive heart failure. JAMA 2005, 294, 334–341. (CrossRef)
26. Malinowski, B.; Zalewska, K.; W˛esierska, A.; Sokołowska, M.M.; Socha, M.; Liczner, G.; Pawlak-Osi ´nska, K.; Wici ´nski, M. Intermittent Fasting in Cardiovascular Disorders-An Overview. Nutrients 2019, 11, 673. (CrossRef
27. Wan, R.; Weigand, L.A.; Bateman, R.; Griffioen, K.; Mendelowitz, D.; Mattson, M.P. Evidence that BDNF regulates heart rate by a mechanism involving increased brainstem parasympathetic neuron excitability. J. Neurochem. 2014, 129, 573–580. (CrossRef)
28. Albosta, M.; Bakke, J. Intermittent fasting: Is there a role in the treatment of diabetes? A review of the literature and guide for primary care physicians. Clin. Diabetes Endocrinol. 2021, 7, 3. (CrossRef) (PubMed)
29. VanItallie, T.B.; Nonas, C.; Di Rocco, A.; Boyar, K.; Hyams, K.; Heymsfield, S.B. Treatment of Parkinson Disease with Diet-Induced Hyperketonemia: A Feasibility Study. Neurology 2005, 64, 728–730. (Google Scholar) (CrossRef)
30. Phillips, M.C.L.; Murtagh, D.K.; Gilbertson, L.J.; Asztely, F.J.; Lynch, C.D. Low-Fat versus Ketogenic Diet in Parkinson's Disease: A Pilot Randomized Controlled Trial. Mov. Disord. 2018, 33, 1306–1314. (Google Scholar) (CrossRef)
31. Taylor, M.K.; Sullivan, D.K.; Mahnken, J.D.; Burns, J.M.; Swerdlow, R.H. Feasibility and Efficacy Data from a Ketogenic Diet Intervention in Alzheimer's Disease. Alzheimers Dement. 2018, 4, 28–36. (Google Scholar) (CrossRef)
32. Castellano, C.; Nugent, S.; Paquet, N.; Tremblay, S.; Bocti, C.; Lacombe, G.; Imbeault, H.; Turcotte, É; Fulop, T.; Cunnane, S.C. Lower Brain 18F-Fluorodeoxyglucose Uptake but Normal 11C-Acetoacetate Metabolism in Mild Alzheimer's Disease Dementia. J. Alzheimers Dis. 2015, 43, 1343–1353. (Google Scholar) (CrossRef)
33. Warburg, O. ; Posener, K.; Negelein, E. Ueber den stoffwechsel der tumoren. Biochem. Z. 1924, 152, 319–344. (Google Scholar)
34. De Cabo R, Mattson MP. Effects of intermittent fasting on health, aging, and disease. N Engl J Med. 2019;381:2541-2551.
35. Patterson RE, Laughlin GA, LaCroix AZ, et al. Intermittent fasting and human metabolic health. J Acad Nutr Diet. 2015;115:1203-1212.
36. Cho Y, Hong N, Kim KW, et al. The effectiveness of intermittent fasting to reduce body mass index and glucose metabolism: a systematic review and metaanalysis. J Clin Med. 2019;8:1645.
37. Grossmann ME, Cleary MP. The balance between leptin and adiponectin in the control of carcinogenesis—focus on mammary tumorigenesis. Biochimie. 2012;94:2164-2171.
38. Van Niekerk G, Hattingh SM, Engelbrecht AM. Enhanced therapeutic efficacy in cancer patients by short-term fasting: the autophagy connection. Frontiers in Oncology. 2016 Nov 14;6:242.

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