

## 科学研究費助成事業 研究成果報告書

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研究課題名(和文) 関節軟骨に対するテネascin C の修復促進・変性抑制の分子機構解明と治療への応用

研究課題名(英文) Mechanism of articular cartilage repair and prevention of cartilage degeneration with tenascin C and application for treatment

研究代表者

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研究成果の概要(和文)：テネascin C(TNC)の軟骨修復効果をみるため、家兎膝に骨軟骨欠損を作製し、硫酸化ジェラン固定化ジェランスポンジを担体としたTNCを投与したところ、良好な軟骨修復を認めた。マウスの膝に骨軟骨欠損を作製し、TNCを欠損部に直接投与しても良好な軟骨修復を認めた。軟骨変性抑制作用を調べるために、マウスの靭帯切断による変形性関節症モデルを作製し、TNCを投与すると6週まで軟骨変性が抑制されていた。すなわち、TNCは軟骨修復作用、軟骨変性抑制作用があることが示された。培養軟骨細胞にTNCを添加すると、ADAMTS4は発現量が増加したが、ADAMTS5は減少した。

研究成果の概要(英文)：We implanted Gellan-GS soaked in TNC into full-thickness osteochondral defects of the patellar groove of rabbits. Histologically as well as macroscopically, we found satisfactory repair of cartilage. Using mice, full-thickness osteochondral defects were created and the defects were filled with TNC. Histologic study showed satisfactory repair of cartilage. In posttraumatic osteoarthritis model with transection of anterior cruciate ligament and medial collateral ligament, we performed intra-articular injection of TNC. TNC administration markedly protected the articular cartilage from proteoglycan depletion for 6 weeks. These studies indicated that TNC could promote cartilage repair and protect cartilage degeneration in vivo. Although TNC upregulated the expression of ADAMTS4, TNC downregulated the expression of ADAMTS5.

研究分野：医歯薬学

キーワード：関節軟骨 テネascin

1. 研究開始当初の背景

軟骨損傷や変性に対する新しい治療法に利用する候補分子として、テネイシン C (TNC) に着目した。TNC はマトリックス細胞タンパクの一つであり、軟骨培養細胞を用いた研究や、TNC ノックアウトマウスの検討から、TNC が軟骨修復を促進していることを明らかにした。

2. 研究の目的

TNC の担体となる硫酸化ジェラン固定化ジェランを用いた徐放実験と TNC の家兔関節軟骨欠損修復効果の検討、TNC のマウス関節軟骨欠損修復効果、軟骨変性抑制の効果の検討を行う。さらに TNC の軟骨に対する作用の分子メカニズムを検討する。

3. 研究の方法

TNC の徐放性を検討するために、硫酸化ジェラン固定化ジェランに TNC を含浸させ、PBS 入りのチューブに入れ、TNC 濃度を ELISA キットを用いて測定した。

関節軟骨修復効果を見るため、家兔大腿骨関節面に大きさ 4mm 径の軟骨下骨を貫く骨軟骨欠損を作製した。担体として硫酸化ジェラン固定化ジェランスポンジを用い、TNC 濃度は 10 µg/ml、100 µg/ml とした。コントロールとして、TNC を含浸させず、生食を含浸させたものを作製した。軟骨欠損修復効果を組織学的に評価した。

マウスの大腿骨関節面に大きさ 0.3mm 径で、軟骨下骨を貫く骨軟骨欠損を作製し、TNC を欠損部に直接投与した。TNC 濃度は 10 µg/ml、100 µg/ml とし TNC を投与しないコントロール群も作製し、組織学的に検討した。

関節軟骨変性抑制作用を調べるために、マウスの前十字靭帯および内側側副靭帯切離して、変形性関節症モデルを作製し、TNC (10 µg/ml、100 µg/ml) を投与し、組織学的に評価した。

培養軟骨細胞の TNC 添加の有無による遺伝子発現の変化を real-time PCR を用いて炎症性サイトカイン (TNF, IL1-, NF B), 軟骨細胞に対する anabolic factor (bFGF, TGF, TIMP3), catabolic factor (ADAMTS4, ADAMTS5, MMP3, MMP13) の各群において検討した。

4. 研究成果

徐放実験において、4 日以降、硫酸化ジェラン固定化ジェランスポンジから徐放される TNC の濃度は、コラーゲンスポンジと比較して有意に高値であった。(図 1)

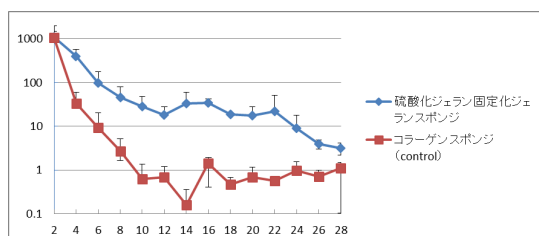


図 1. 徐放実験

家兔関節軟骨欠損修復効果の検討において、TNC 10 µg/ml 投与群は TNC 100 µg/ml 投与群、生食群より有意に良好な結果であった (図 2)。

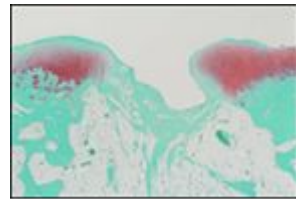
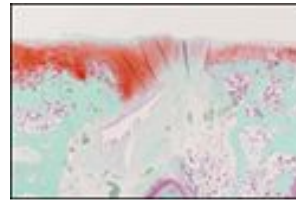


図 2. 組織像 (サフラニン O 染色) 家兔軟骨欠損に TNC 含浸硫酸化ジェラン埋植後 12 週. TNC 10 µg/ml 投与 (上) はコントロール (下) より軟骨修復良好。

マウス関節軟骨欠損修復効果の検討において、TNC 100 µg/ml 投与群は良好な軟骨修復を認めた。

マウス関節軟骨変性抑制効果の検討において、TNC の投与は 10 µg/ml、100 µg/ml とともに 6 週までの軟骨変性抑制に有効であった (図 3)。

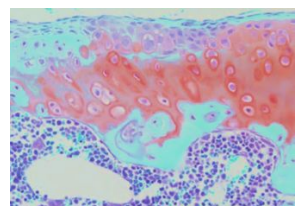
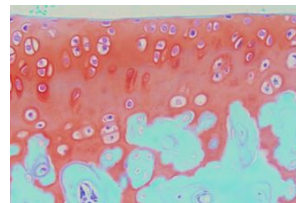


図 3. 組織像 (サフラニン O 染色) マウス OA モデル 6 週. TNC 投与 (上) はコントロール (下) より軟骨変性を抑制。

TNF, IL1-, NF B は TNC 投与により有意に発現量の増加を認めた。TGF, TIMP3 も有意に発現量の増加を認めた。ADAMTS4, MMP3, MMP13 は有意に発現量の増加を認めたが、軟骨変性に最も関与しているとされる ADAMTS5 では発現量の減少を認めた。

## 5. 主な発表論文等

(研究代表者、研究分担者及び連携研究者には下線)

[雑誌論文](計 31 件)

- 1) Hasegawa M, Takagita H, Sudo A. Prediction of post-operative range of motion using intra-operative soft tissue balance in total knee arthroplasty with navigation. *Comput Aided Surg*. 査読有: 20, 2015, 47-51  
doi: 10.3109/10929088.
- 2) Ikemura S, Hasegawa M, Iino T, Miyamoto K, Imanaka-Yoshida K, Yoshida T, Sudo A. Effect of tenascin-C on the repair of full-thickness osteochondral defects of articular cartilage in rabbits. *J Orthop Res* 査読有: 33, 2015, 563-571  
doi: 10.1002/jor.22794.
- 3) Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Kono T, Sudo A. Cortical Thickness of the Femur and Long-term Bisphosphonate Use. *J Bone Miner Res*. 査読有: 30, 2015, 225-231  
doi: 10.1002/jbmr.2345.
- 4) Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Kono T, Sudo A. Analysis of daily teriparatide treatment for osteoporosis in men. *Osteoporos Int*. 査読有: 26, 2015, 1303-1309  
doi: 10.1007/s00198-014-3001-1.
- 5) Miura Y, Hasegawa M, Sudo A, Pezzotti G, Puppulin L. In-vivo degradation of middle-term highly cross-linked and remelted polyethylene cups: Modification induced by creep, wear and oxidation. *J Mech Behav Biomed Mater*. 査読有: 51, 2015, 13-24  
doi: 10.1016/j.jmbbm.2015.06.028.
- 6) Wakabayashi H, Hasegawa M, Niimi R, Sudo A. Clinical analysis of preoperative deep vein thrombosis risk factors in patients undergoing total hip arthroplasty. *Thromb Res*. 査読有: 136, 2015, 855-858  
doi: 10.1016/j.thromres.2015.06.021.
- 7) Hasegawa M, Miyamoto N, Miyazaki S, Wakabayashi H, Sudo A. Longitudinal Magnetic Resonance Imaging of Pseudotumors Following Metal-on-Metal Total Hip Arthroplasty. *J Arthroplasty*. 査読有: 29, 2014, 2236-2238  
doi: 10.1016/j.arth.2014.05.006.
- 8) Okita S, Hasegawa M, Takahashi Y, Puppulin L, Sudo A, Pezzotti G. Failure analysis of sandwich-type ceramic-on-ceramic hip joints: A spectroscopic investigation into the role of the polyethylene shell component. *J Mech Behav Biomed Mater*. 査読有: 31, 2014, 55-67

doi: 10.1016/j.jmbbm.2013.01.022.

- 9) Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Nakamura T, Kono T, Sudo A. An algorithm using the early changes in PINP to predict the future BMD response for patients treated with daily teriparatide. *Osteoporos Int*. 査読有: 25, 2014, 377-384  
doi: 10.1007/s00198-013-2426-2.
- 10) Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Kono T, Sudo A. Efficacy of the dynamic radiographs for diagnosing acute osteoporotic vertebral fractures. *Osteoporos Int*. 査読有: 25, 2014, 605-612  
doi: 10.1007/s00198-013-2456-9.
- 11) Sugano N, Iida H, Akiyama H, Takatori Y, Nagoya S, Hasegawa M, Kabata T, Hachiya Y, Yasunaga Y. Nationwide investigation into adverse tissue reactions to metal debris after metal-on-metal total hip arthroplasty in Japan. *J Orthop Sci*. 査読有: 19, 2014, 85-89  
doi: 10.1007/s00776-013-0490-2.
- 12) Akeda K, Matsunaga H, Imanishi T, Hasegawa M, Sakakibara T, Kasai Y, Sudo A. Prevalence and Countermeasures for Venous Thromboembolic Diseases Associated With Spinal Surgery: A Follow-up Study of an Institutional Protocol in 209 Patients. *Spine (Phila Pa 1976)*. 査読有: 39, 2014, 791-797  
doi: 10.1097/BRS.0000000000000295.
- 13) Mizutani N, Kageyama S, Yamada M, Hasegawa M, Miyamoto K, Horiuchi T. The behavior of ligament cells cultured on elastin and collagen scaffolds. *J Artif Organs*. 査読有: 17, 2014, 50-59  
doi: 10.1007/s10047-013-0736-y.
- 14) Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Kono T, Sudo A. Determinants associated with bone mineral density increase in response to daily teriparatide treatment in patients with osteoporosis. *Bone*. 査読有: 66, 2014, 26-30  
doi: 10.1016/j.bone.2014.05.017.
- 15) Puppulin L, Leto A, Hasegawa M, Pezzotti G. A comparative microstructural study of vitamin-E blended and infused highly crosslinked UHMWPE for total knee arthroplasty. *J Mech Behav Biomed Mater*. 査読有: 39, 2014, 247-256  
doi: 10.1016/j.jmbbm.2014.07.029.
- 16) Aota T, Naitoh K, Wada H, Yamashita Y, Miyamoto N, Hasegawa M, Wakabayashi H, Yoshida K, Asanuma K, Matsumoto T, Ohishi K, Shimokariya Y, Yamada N, Nishikawa M, Katayama N, Uchida A, Sudo A. Elevated soluble platelet glycoprotein VI is a useful marker for DVT in postoperative patients treated with edoxaban. *Int J*

Hematol. 査読有:100, 2014, 450-456  
doi: 10.1007/s12185-014-1676-x.

17) Wakabayashi H, Takigawa S, Hasegawa M, Kakimoto T, Yoshida K, Sudo A. Polyarticular late infection of total joint arthroplasties in a patient with rheumatoid arthritis treated with anti-interleukin-6 therapy. *Rheumatology (Oxford)*. 査読有: 53, 2014, 1150-1151  
doi: 10.1093/rheumatology/ket379.

18) Hasegawa M, Yoshida K, Wakabayashi H, Sudo A. Cutting and implanting errors in minimally invasive total knee arthroplasty using a navigation system. *Int Orthop*. 査読有: 37, 2013, 27-30  
doi: 10.1007/s00264-012-1688-1.

19) Hasegawa M, Sudo A. In vivo wear performance of highly cross-linked polyethylene vs. yttria stabilized zirconia and alumina stabilized zirconia at a mean seven-year follow-up. *BMC Musculoskelet Disord*. 査読有:14, 2013, 154  
doi: 10.1186/1471-2474-14-154.

20) Hasegawa M, Yoshida K, Wakabayashi H, Sudo A. Prevalence of adverse reactions to metal debris following metal-on-metal THA. *Orthopedics*. 査読有: 36, 2013, e606-e612  
doi: 10.3928/01477447-20130426-23.

21) Hasegawa M, Horiki N, Tanaka K, Wakabayashi H, Tano S, Katsurahara M, Uchida A, Takei Y, Sudo A. The efficacy of rebamipide add-on therapy in arthritic patients with COX-2 selective inhibitor-related gastrointestinal events: a prospective, randomized, open-label blinded-endpoint pilot study by the GLORIA study group. *Mod Rheumatol*. 査読有: 23, 2013, 1172-1178  
doi: 10.1007/s10165-012-0819-2.

22) Hasegawa M, Wada H, Wakabayashi H, Yoshida K, Miyamoto N, Asanuma K, Matsumoto T, Ohishi K, Shimokariya Y, Yamada N, Uchida A, Sudo A. The relationships among hemostatic markers, the withdrawal of fondaparinux due to a reduction in hemoglobin and deep vein thrombosis in Japanese patients undergoing major orthopedic surgery. *Clin Chim Acta*. 査読有: 425, 2013, 109-113  
doi: 10.1016/j.cca.2013.07.009.

23) Ishiguro S, Asano N, Yoshida K, Nishimura A, Wakabayashi H, Yokochi A, Hasegawa M, Sudo A, Maruyama K. Day zero ambulation under modified femoral nerve block after minimally invasive surgery for total knee arthroplasty: preliminary report. *J Anesth*. 査読有: 27, 2013, 132-134  
doi: 10.1007/s00540-012-1479-2.

24) Wakabayashi H, Hasegawa M, Nishioka Y, Minami Y, Nishioka K, Sudo A. Clinical outcome in patients with rheumatoid arthritis switched to tocilizumab after etanercept or infliximab failure. *Clin Rheumatol*. 査読有: 32, 2013, 253-259  
doi: 10.1007/s10067-012-2118-x.

25) Hori K, Tsujii M, Iino T, Satonaka H, Uemura T, Akeda K, Hasegawa M, Uchida A, Sudo A. Protective effect of edaravone for tourniquet-induced ischemia-reperfusion injury on skeletal muscle in murine hindlimb. *BMC Musculoskelet Disord*. 査読有:14, 2013, 113  
doi: 10.1186/1471-2474-14-113.

26) Wakabayashi H, Hasegawa M, Yoshida K, Nishioka K, Sudo A. Hip score and disease activity correlation in patients with rheumatoid arthritis after total hip arthroplasty. *Int Orthop*. 査読有: 37, 2013, 1245-1250  
doi: 10.1007/s00264-013-1900-y.

27) Yamaguchi T, Matsumine A, Niimi R, Nakamura T, Matsubara T, Asanuma K, Hasegawa M, Sudo A. Deep-vein thrombosis after resection of musculoskeletal tumours of the lower limb. *Bone Joint J*. 査読有: 95-B, 2013, 1280-1284  
doi: 10.1302/0301-620X.95B9.30905.

〔学会発表〕(計 32 件)

1) Masahiro Hasegawa, Yoshiaki Suzuki, Hironori Unno, Shine Tone, Toshio Yamaguchi, Shinichi Miyazaki, Hiroki Wakabayashi, Akihiro Sudo. Predictors of Symptomatic Pseudotumors after Metal-on-metal Total Hip Arthroplasty. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

2) Hironori Unno, Masahiro Hasegawa, Yuriyo Matsui, Naoya Ito, Yoshiaki Suzuki, Takahiro Iino, Kyoko Imanaka Yoshida, Toshimichi Yoshida, Akihiro Sudo. Prevention Of Cartilage Degeneration And Repairing Cartilage Using Tenascin-c. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

3) Yoshiaki Suzuki, Masahiro Hasegawa, Yuriyo Matsui, Hironori Unno, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Chondroprotective Effect of Rebamipide in Primary Cultured Chondrocytes from Human knee OA. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

4) Yoshiaki Suzuki, Masahiro Hasegawa, Naoya Ito, Hironori Unno, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Osteoporosis Developed Articular Cartilage Degeneration by Subchondral

Bone loss. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

5) Naoya Ito, Masahiro Hasegawa, Hironori Unno, Yoshiaki Suzuki, Yoshihiro Miura, Yuriyo Matsui, Keiichi Miyamoto, Akihiro Sudo. Effect Of Elastin On Healing Of The Medial Collateral Ligament in Rabbits. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

6) Hiroki Wakabayashi, Masahiro Hasegawa, Rui Niimi, Shinichi Miyazaki, Toshio Yamaguchi, Akihiro Sudo. The Risk Factor of Preoperative Deep Vein Thrombosis in Patients Undergoing Primary Total Knee Arthroplasty. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

7) Takahiro Iino, Masaya Tsujii, Tadashi Tsukamoto, Takuya Nakanishi, Masahiro Hasegawa, Akihiro Sudo. Thrombin And Osteopontin Involve The Differentiation Into Myofibroblast In Fibrous Cord Of Dupuytren's Disease. Orthopaedic Research Society Annual Meeting 2016. 2016.3.5-8, Orlando (USA)

8) Masahiro Hasegawa, Shinichi Miyazaki, Noriki Miyamoto, Hiroki Wakabayashi, Akihiro Sudo. Immune Response in Patients with Pseudotumors after Metal-on-metal Total Hip Arthroplasty. American Academy of Orthopaedic Surgeons Annual Meeting 2015. 2015.3.24-28, Las Vegas (USA)

9) Masahiro Hasegawa, Shinichi Miyazaki, Noriki Miyamoto, Hiroki Wakabayashi, Akihiro Sudo. The Immune Response in Patients with Adverse Reactions to Metal Debris. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

10) Hironori Unno, Masahiro Hasegawa, Yuriyo Matsui, Yoshiaki Suzuki, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Administrations Of Tenascin-c Delay Cartilage Degeneration In Murine Models Of Osteoarthritis. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

11) Yoshiaki Suzuki, Masahiro Hasegawa, Yuriyo Matsui, Hiroshi Unno, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Intra-articular injection of rebamipide prevents articular cartilage degeneration in murine models of osteoarthritis. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

12) Yoshihiro Miura, Masahiro Hasegawa, Leonardo Puppulin, Akihiro Sudo, Giuseppe Pezzotti. Mechanical And Chemical

Analyses In Highly Crosslinked Polyethylene By Raman Spectroscopy. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

13) Akinobu Nishimura, Kazunori Hamamura, Masahiro Hasegawa, Akihiro Sudo, Hiroki Yokota. Salubrinal Suppresses Cartilage Degeneration in a Murine Knee Osteoarthritis Model. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

14) Hiroki Wakabayashi, Masahiro Hasegawa, Rui Niimi, Akihiro Sudo. Clinical Analysis Of Preoperative Deep Vein Thrombosis Risk Factors In Patients Undergoing Total Hip Arthroplasty. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

15) Takahiro Iino, Masaya Tsujii, Toru Wakabayashi, Naoki Kokubu, Hirokazu Yokoyama, Takuya Nakanishi, Masahiro Hasegawa, Akihiro Sudo. The Secreted Aggrecanases From Synovium In Rotator Cuff Tear Participate In Progression Of Cartilage Degradation In The Shoulder Joint. Orthopaedic Research Society Annual Meeting 2015. 2015.3.28-31, Las Vegas (USA)

16) Masahiro Hasegawa, Shinichi Miyazaki, Noriki Miyamoto, Hironori Unno, Yoshiaki Suzuki, Hiroki Wakabayashi, Akihiro Sudo. The Immune Response in Patients with Adverse Local Tissue Reaction following Metal-on-metal Total Hip Arthroplasty. 16th EFORT Congress. 2015.5.27-29, Prague (Czech Republic)

17) Hironori Unno, Masahiro Hasegawa, Yoshiaki Suzuki, Yuriyo Matsui, Takahiro Iino, Kyoko Imanaka-Yoshida, Toshimichi Yoshida, Akihiro Sudo. Full-length tenascin-C prevent articular cartilage degeneration without promoting synovitis in murine models of osteoarthritis. 16th EFORT Congress. 2015.5.27-29, Prague (Czech Republic)

18) Yoshiaki Suzuki, Masahiro Hasegawa, Yuriyo Matsui, Hironori Unno, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Intra-articular injection of rebamipide prevents articular cartilage degeneration. 16th EFORT Congress. 2015.5.27-29, Prague (Czech Republic)

19) Shinichi Miyazaki, Masahiro Hasegawa, Hironori Unno, Yoshiaki Suzuki, Noriki Miyamoto, Hiroki Wakabayashi, Akihiro Sudo. The wear of highly cross-linked polyethylene in total hip arthroplasty with 32mm cobalt-chromium head. 16th EFORT Congress. 2015.5.27-29, Prague (Czech

Republic)

20) Noriki Miyamoto, Masahiro Hasegawa, Shinichi Miyazaki, Hiroki Wakabayashi, Akihiro Sudo. Femoral bone resection with cementless total hip arthroplasty using standard vs. short flat tapered wedge stem. 16th EFORT Congress. 2015.5.27-29, Prague (Czech Republic)

21) Yoshihiro Miura, Masahiro Hasegawa, Leonardo Puppulin, Giuseppe Pezzotti, Akihiro Sudo. Mechanical and chemical analysis of highly cross-linked polyethylene by Raman spectroscopy. 16th EFORT Congress. 2015.5.27-29, Prague (Czech Republic)

22) 海野宏至、長谷川正裕、鈴木慶亮、松井佑梨世、今中(吉田)恭子、吉田利通、湊藤啓広。Full-length テネascin C は変形性関節症モデルマウスにおいて滑膜炎の増悪を伴わず軟骨変性を抑制する。第 47 回結合組織学会。2015.5.15-16, コクヨホール(東京都港区)

23) 海野宏至、長谷川正裕、鈴木慶亮、松井佑梨世、湊藤啓広。Full-length テネascin C 投与における変形性関節症モデルマウスの軟骨、滑膜評価。第 7 回 JOSKAS。2015.6.18-20, 札幌コンベンションセンター(北海道札幌市)

24) 海野宏至、長谷川正裕、鈴木慶亮、松井佑梨世、今中(吉田)恭子、吉田利通、湊藤啓広。テネascin C 投与による軟骨変性抑制効果とそのメカニズム。第 43 回関節病学会。2015.11.5-6, 札幌コンベンションセンター(北海道札幌市)

25) 海野宏至、長谷川正裕、鈴木慶亮、今中(吉田)恭子、吉田利通、湊藤啓広。テネascin C による軟骨修復機構についての in vitro での検討。第 30 回日本整形外科学会基礎学術集会。2015.10.22-23, 富山国際会議場(富山県富山市)

26) Masahiro Hasegawa, Noriki Miyamoto, Shinichi Miyazaki, Hiroki Wakabayashi, Akihiro Sudo. Longitudinal Study of Pseudotumors after Metal-on-metal Total Hip Arthroplasty using Magnetic Resonance Imaging. American Academy of Orthopaedic Surgeons Annual Meeting 2014. 2014.3.11-15, New Orleans (USA)

27) Masahiro Hasegawa, Noriki Miyamoto, Shinichi Miyazaki, Hiroki Wakabayashi, Akihiro Sudo. Longitudinal Study of Pseudotumors Following Large-diameter Metal-on-metal Total Hip Arthroplasty Using Magnetic Resonance Imaging. Orthopaedic Research Society Annual Meeting 2014. 2014.3.15-18, New Orleans (USA)

28) Yuriyo Matsui, Masahiro Hasegawa, Takahiro Iino, Toshimichi Yoshida, Akihiro Sudo. Tenascin-C Prevents

Articular Cartilage Degeneration in Murine Models of Osteoarthritis. Orthopaedic Research Society Annual Meeting 2014. 2014.3.15-18, New Orleans (USA)

29) Takahiro Iino, Masahiro Hasegawa, Akihiro Sudo. Potential Role of Expression of Osteopontin in Fibrous Cord for Pathology of Dupuytren's Disease. Orthopaedic Research Society Annual Meeting 2014. 2014.3.15-18, New Orleans (USA)

30) Masahiro Hasegawa, Kakunosin Yoshida, Hiroki Wakabayashi, Noriki Miyamoto, Yuriyo Matsui, Akihiro Sudo. MRI screening of pseudotumors following large-diameter metal-on-metal total hip arthroplasty and metal ion release. 14th EFORT Congress. 2013.6.5-8, Istanbul (Turkey)

31) Noriki Miyamoto, Masahiro Hasegawa, Kakunosin Yoshida, Hiroki Wakabayashi, Yuriyo Matsui, Akihiro Sudo. Progress of Stress Shielding after Cementless Total Hip Arthroplasty with Versys Fiber Metal Taper Stem -Minimum 5-Year Follow-Up. 14th EFORT Congress. 2013.6.5-8, Istanbul (Turkey)

32) Yuriyo Matsui, Masahiro Hasegawa, Hiroki Wakabayashi, Noriki Miyamoto, Akihiro Sudo. Application of intraoperative motor-evoked potential monitoring in Total Hip Arthroplasty. 14th EFORT Congress. 2013.6.5-8, Istanbul (Turkey)

【その他】

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